INTERAVIA

REVIEW OF WORLD AVIATION

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Fourteen Countries at Le Bourget

Executive Aircraft

VOLUME XII 7 JULY 1957

PROPELLER-DRIVEN AIRCRAFT

FIAT G46 — Trainer • FIAT G49 — Trainer • FIAT G59 — Trainer • FN-333 — Touring and general purpose amphibian

JET AIRCRAFT

FIAT G82 — Operational trainer • FIAT G91 — Light tactical support fighter for N.A.T.O. • FIAT G91T — Operational trainer • FIAT F86K (North American Aviation licence) — All-weather fighter • FIAT VAMPIRE (de Havilland licence) — Fighter • NORTH AMERICAN F86D «Sabre» — Overhauls

HELICOPTERS

SIKORSKY S-58 (production of mechanical parts for Sud-Aviation)

JET ENGINES

FIAT 4002 and developments • FIAT GHOST 48Mk1 (de Havilland licence) • ALLISON J35-A-29 (Allison licence) — Production of parts • GENERAL ELECTRIC J47 (General Electric licence) — Production of parts and overhauls • CURTISS WRIGHT «SAPPHIRE» J65 — Production of parts for Curtiss Wright in Europe • FIAT GOBLIN (de Havilland licence)

PISTON ENGINES

PRATT & WHITNEY R.985 (Pratt & Whitney licence) — Production of parts and overhauls • PRATT & WHITNEY R.1830 (Pratt & Whitney licence) — Production of parts and overhauls • PRATT & WHITNEY R.2800 — Overhauls • ROLLS-ROYCE MERLIN 500 — Overhauls • ROLLS-ROYCE PACKARD V-1650/7 — Overhauls • CURTISS WRIGHT Turbo Compound (Curtiss Wright licence) — Overhauls

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2D30 two-blade
23E50 three-blade
FIAT 5010 four-blade
(Modification of Hamilton 24D50 propeller)

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FIAT stand at the 22nd PARIS International Air Show

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INTERAVIA

Review of World Aviation

Volume XII **No. 7** **July 1957**

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FRONT COVER: Helicopter view of the "Static Show" at the 22nd Paris Salon. The heavy *Globemaster* (far left), *Hercules* and *Deux-Ponts* (foreground) and the B-47 and fire-engine-red *Snark* (rear) can be clearly recognized. Right, behind the helicopters, the mock-up of the *Caravelle*.

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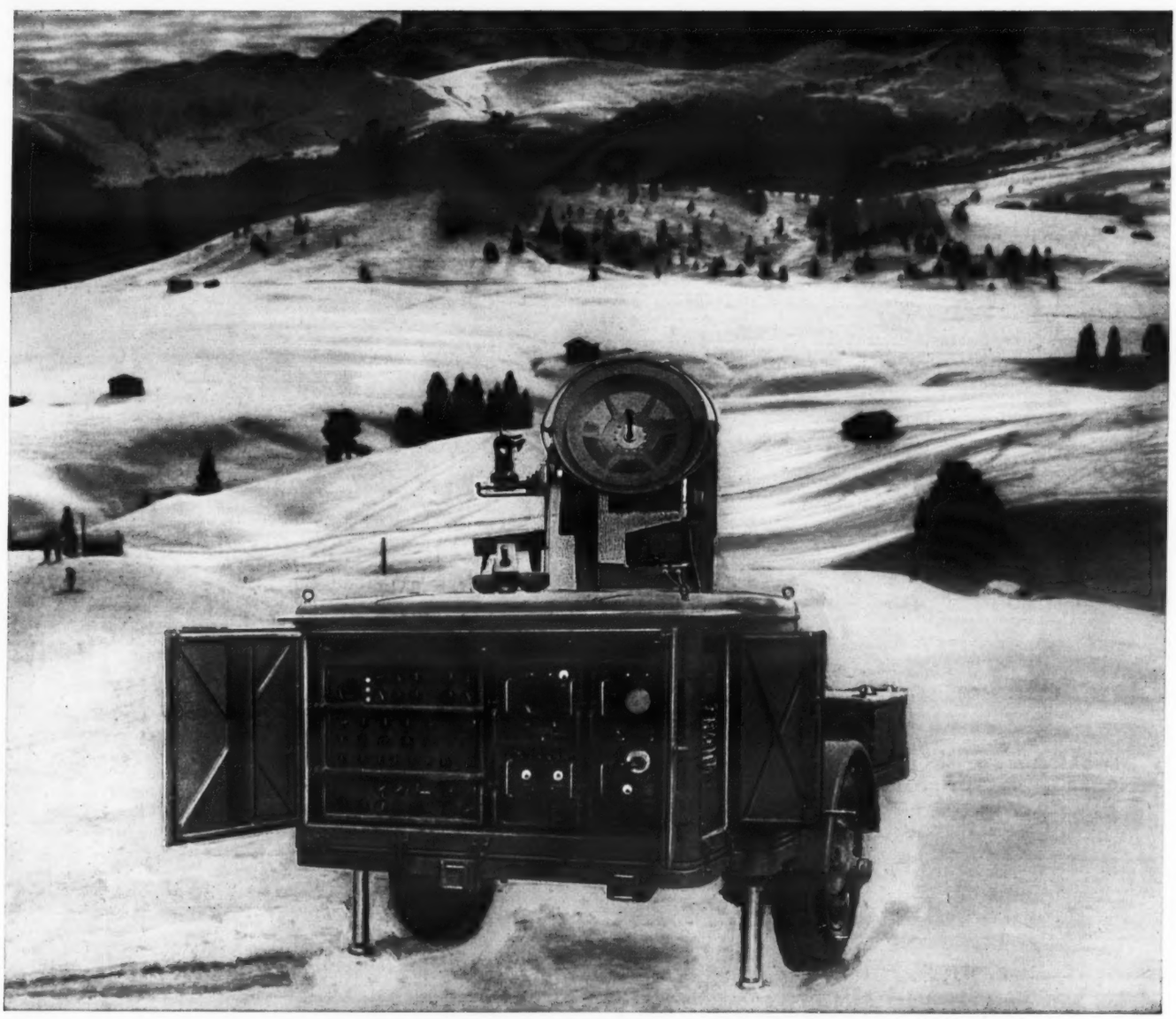

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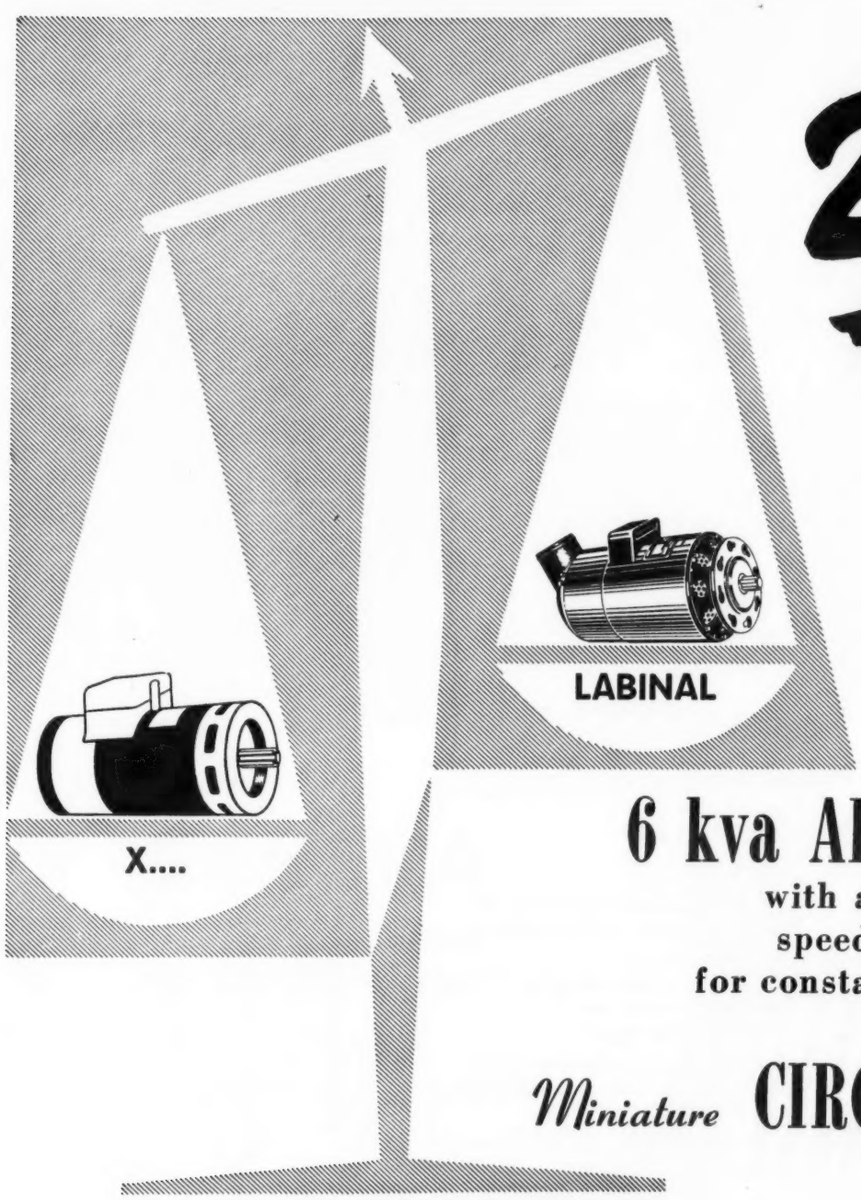

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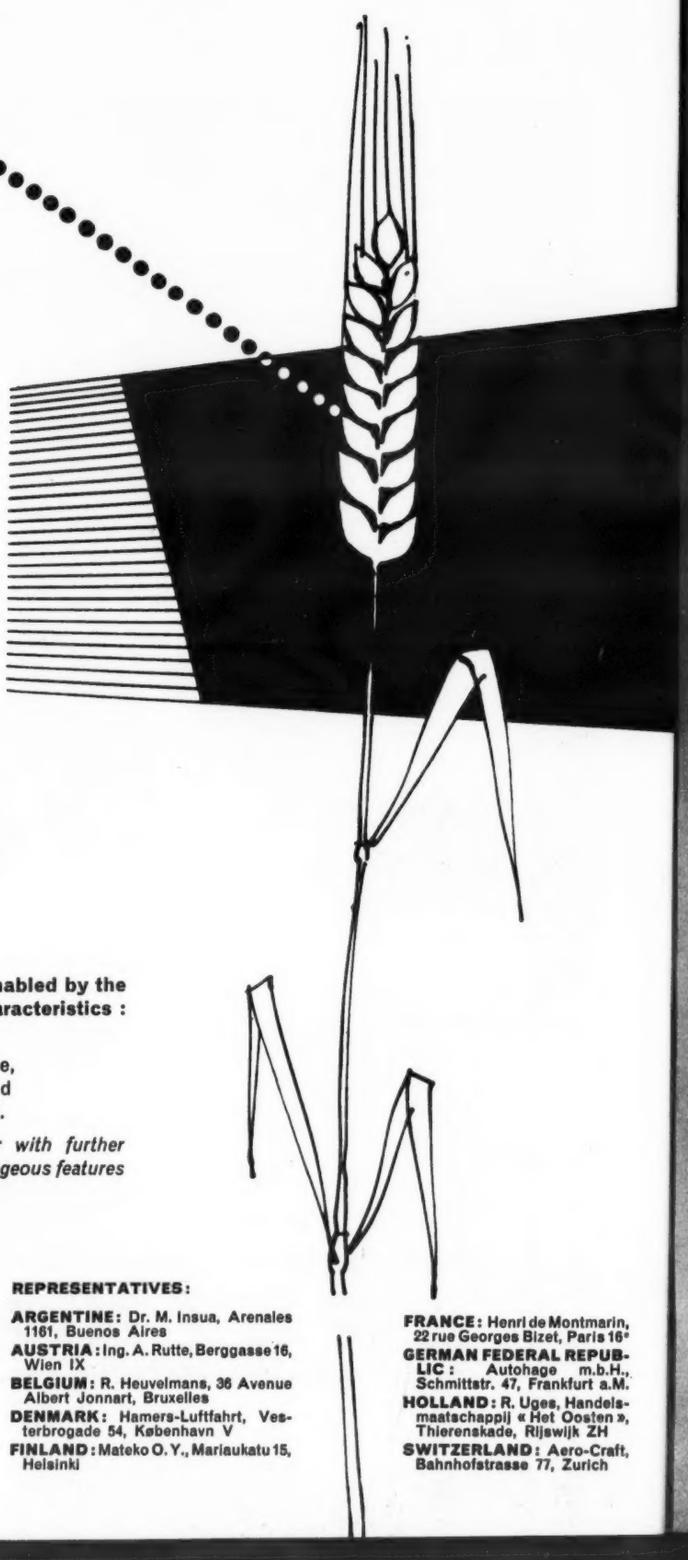

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CARAVELLE is a better money-maker than any other commercial aircraft even on such short runs as Paris to London. It is a MEDIUM-STAGE transport, which does only this job but does it well. The advantages it offers users have attracted airlines because they are sure of winning public favour.

Not a " maid of all work ", not speed at any price.

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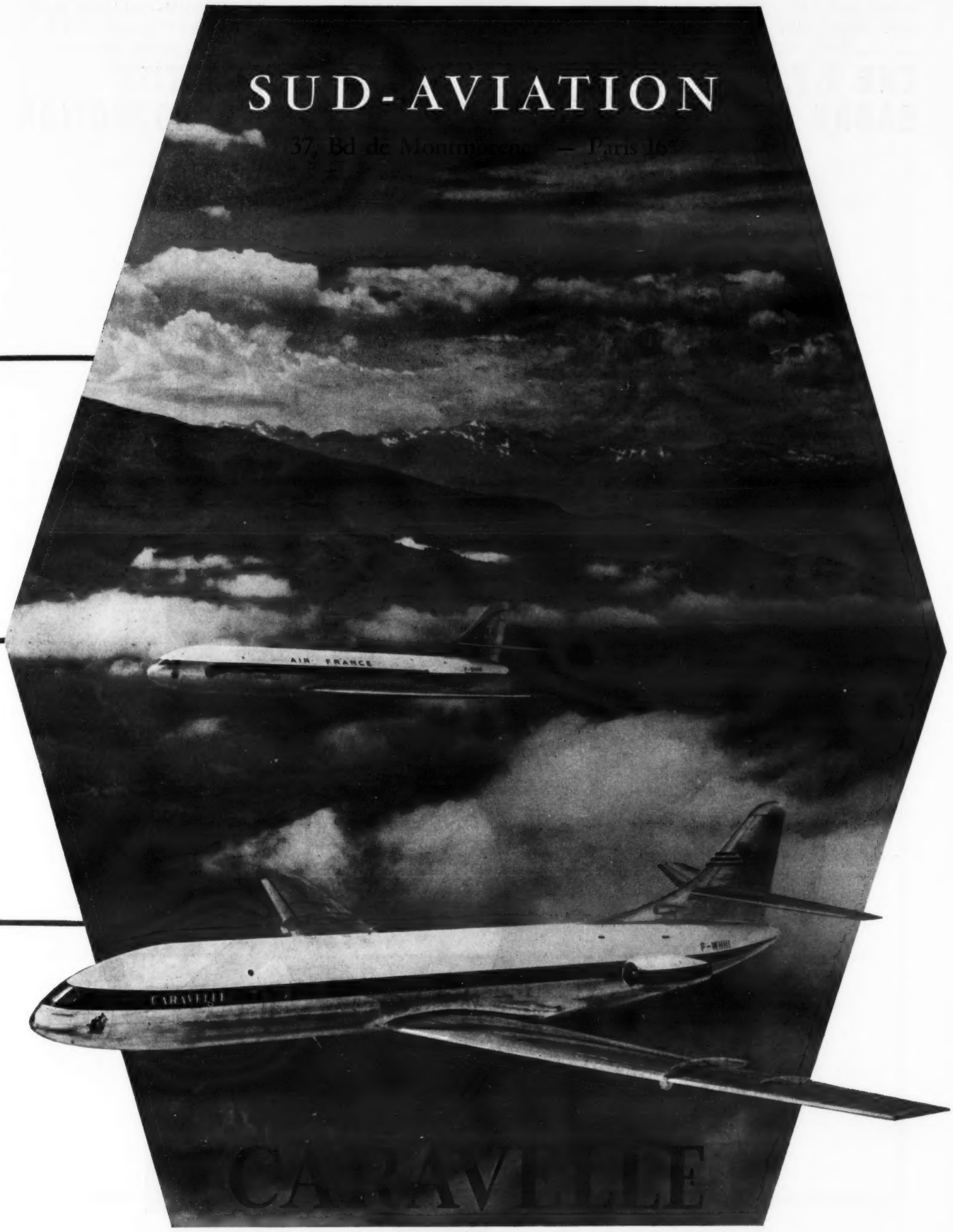

AIR FRANCE will place the CARAVELLE at the service of the public on its European and Mediterranean networks from the end of 1958.

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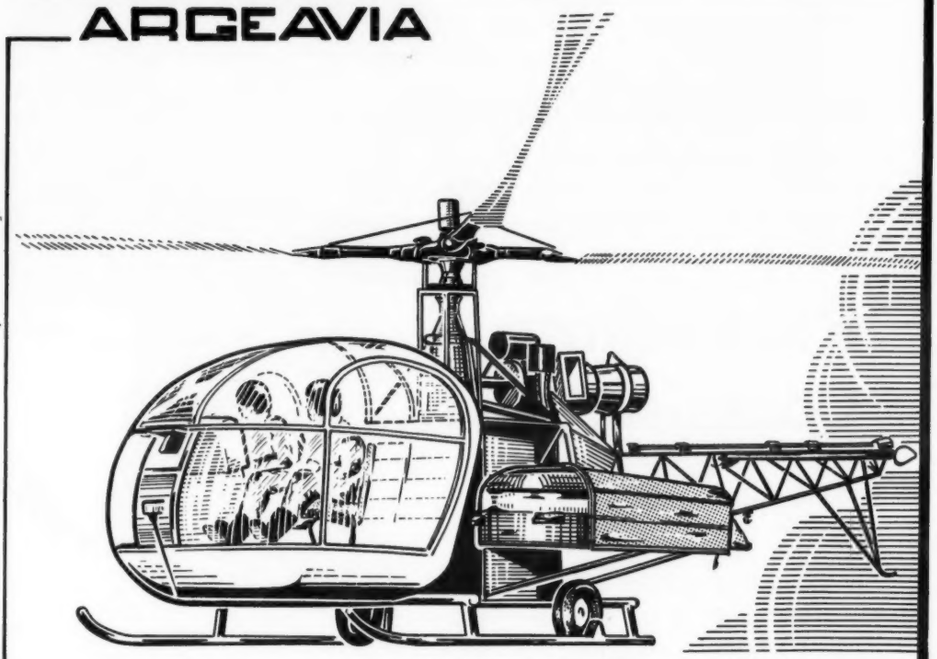
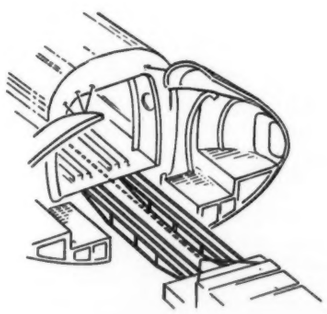
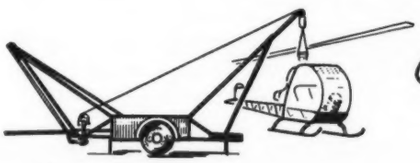
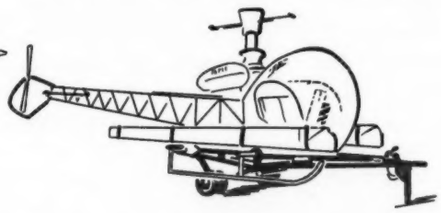


Stretcher-carrying fittings for light helicopters







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Personally speaking

—a series of contributions on questions of the hour by leading aviation personalities.

Professor THEODORE VON KÁRMÁN

requires no introduction. He is generally acknowledged to be the world's greatest living aerodynamicist.

Rocket into Cosmic Space

The velocity which any mass has to reach in order to escape from the gravitational field of our planet and enter into cosmic space amounts to about 25,000 miles per hour. It certainly is possible even by use of presently known propellants to build complex rocket motor systems which would be able to accelerate a relatively small mass to " escape velocity."

However, it appears to me that the use of nuclear energy will make the rocket so much more efficient that serious attempts to build a space ship should await the advent of the nuclear rocket. For a rocket using hydrogen or ammonia as working fluid and a nuclear reactor as heat source, the specific impulse of the working fluid can easily be made several times the present values for the usual propellants, without substantially raising the temperatures to which the rocket walls have to be exposed. Further developments in the use of nuclear processes for propulsion and in heat-resisting materials may allow even more significant improvements.

In the meantime, basic studies in aerodynamics and the physics of rarified, ionized gases, study of radiation effects on material and humans, study of navigation and guidance problems at high altitudes and in space, the gradual exploration of the space surrounding our globe by high-flying manned airplanes, by sounding rockets and unmanned satellites should give the enthusiasts of space travel enough to do. I do not believe in reckless promotion. On the other hand, I think that the " respectable " scientific and engineering societies should not close their doors to the astronauts or the pages of their journals to papers dealing with the problems of space travel. The present congresses and meetings of the astronautical and interplanetary societies have a relatively high scientific level, specially if we compare them with the activities of certain aeronautical societies only twenty-five years before the first mechanical flight.

Perhaps the effort necessary to proceed from the present-day long-range, high-altitude rocket to a manned space vehicle is no more than the effort which led from the Wright brothers' airplane of 1903 to today's supersonic aircraft.

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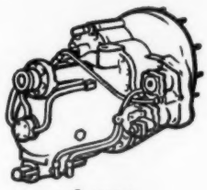
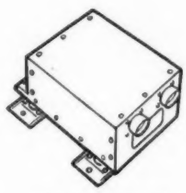
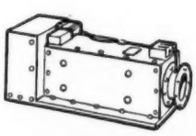


Constant Speed Drives

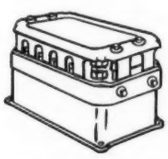
Alternators



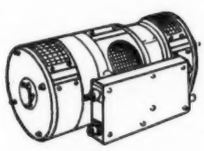
Alternator Control Panels



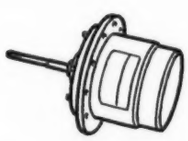
Transformer Rectifier Units



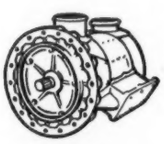
Circuit Breakers



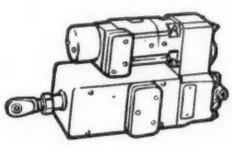
Invertors



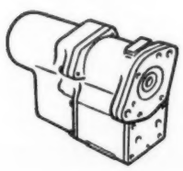
Pump Motors



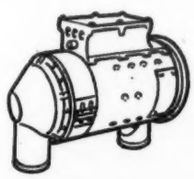
Generators



Linear Actuators



Rotary Actuators



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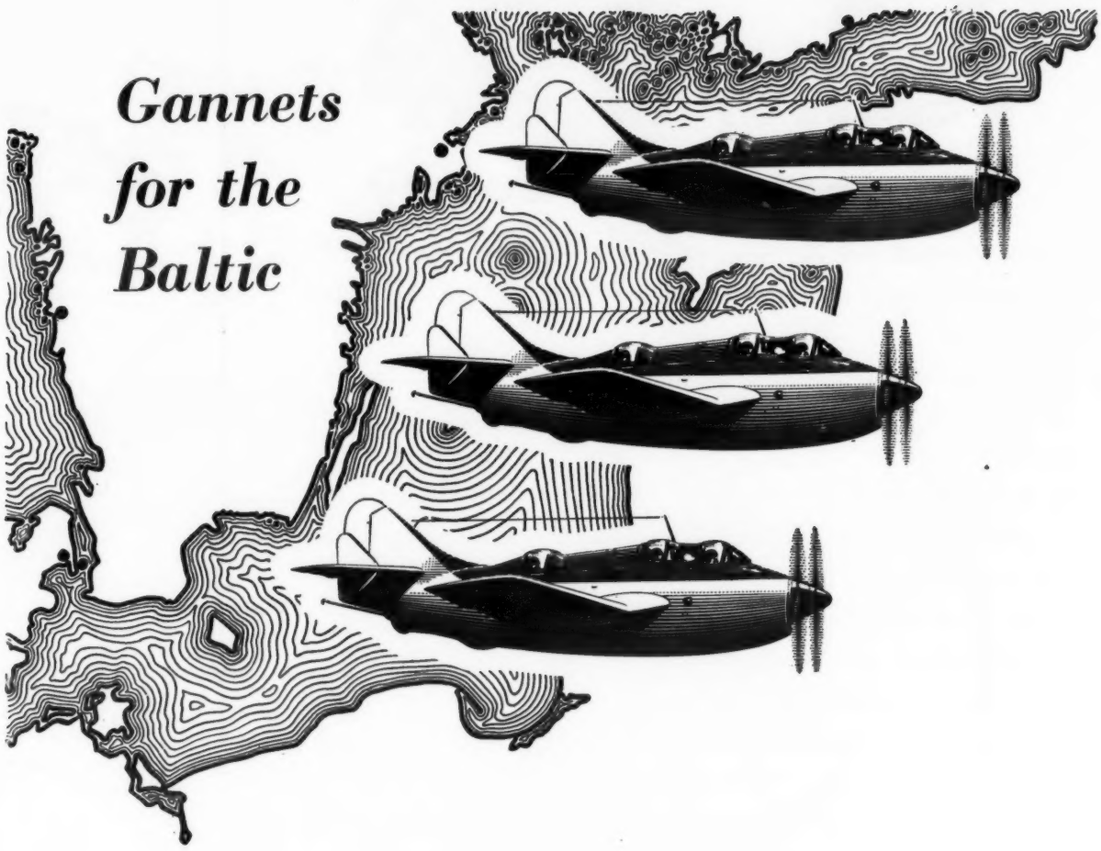

WESTERN GERMANY has ordered Fairey Gannet anti-submarine aircraft for its shore-based Naval Air Arm. The Gannets, combining in a single aircraft the ability both to search *and* strike with long endurance and the most comprehensive search radar, will provide anti-submarine cover in the Western Baltic. Thus one more is added to the long list of seas and oceans under Gannet anti-submarine surveillance.

FAIREY

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SHORE BASED & CARRIER-BORNE

Gannet

Powered by the Armstrong Siddeley Double Mamba

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INTERAVIA

Deadline Notes

No. 7, 1957

● **Sabena** is expected to order eight SE.210 *Caravelle* airliners from Sud-Aviation. A final decision is to be made before the autumn.

● **Scandinavian Airlines System** is seriously contemplating the purchase of six SE.210 *Caravelles* to be delivered in 1958. Company experts have been in France for some weeks to evaluate the aircraft. Negotiations for the contract, at an aggregate cost of approximately 80,000,000 Norwegian kroner, are still in progress.

● **Swissair** will introduce the DC-7C into service on its route to South America, on July 4th, 1957. Intermediate landings at Lisbon and Recife will be eliminated, and flying times from Switzerland to Rio de Janeiro will be cut from 25 hours 45 minutes to 20 hours 40 minutes, to Sao Paulo from 27 hours 55 minutes to 22 hours 45 minutes, and to Buenos Aires from 33 hours 35 minutes to 27 hours 35 minutes. On July 5th a second weekly service to Tokyo will be inaugurated ; the flight, leaving Zürich and Geneva on Fridays, will be operated by way of Athens, Beirut, Karachi, Calcutta, Bangkok and Hong Kong. The existing flight, on Tuesdays, will be routed as follows from July 9th : Cairo (new point of call), Karachi, Bombay, Bangkok, Manila, Tokyo.

● **Ethiopian Airlines'** provisional licence to operate a twice-weekly service between Addis Ababa and Nairobi has been withdrawn by the Kenya authorities. The reasons have not been disclosed.

● **Aristotle Onassis,** proprietor of Olympic Airways, the newly constituted Greek airline company, plans to organize a national Libyan airline, according to a Reuter report from Athens. Negotiations have been going on in Athens between Abdul Razek Shagloub, Permanent Under-Secretary of the Libyan Ministry of Economy, and officials of Olympic Airways.

● **East German Lufthansa** began operating on the following domestic routes on June 16th : from Berlin to Barth (an airport between Rostock and Stralsund), Leipzig, Dresden and Erfurt. From Barth, the following coach connections exist : Zingst-Perow-Wiek, Stralsund-Göhren-Rügen, Ribnitz-Fischland, and Rostock-Warnemünde-Heiligendamm-Kühlungsdamm.

● **Cologne-Wahn Airport :** According to the Federal Ministry of Transport, the Supreme Headquarters, Allied Powers, Europe, have approved a plan for the transfer of Cologne-Wahn Airport to the German authorities, and it will be handed over in August. Barracks nearby will continue to be used by British troops, but these will not be concerned with the operation of the airport.

● **Air France and Lufthansa** have concluded an agreement to operate their South Atlantic services in pool. A similar arrangement has been in force on the two companies' North Atlantic routes for the past 18 months. After July 1st, Air France and Lufthansa jointly will run four services a week from Paris to Rio de Janeiro, Sao Paolo, Montevideo and Buenos Aires. The aircraft used will be Lockheed L-1049 G *Super Constellations.*

● **A Multilateral Agreement** on collaboration and the operation of scheduled services between major cities was signed in Budapest on June 8th by representatives of Government airlines of Czechoslovakia, the German Democratic Republic, Hungary, Poland, Rumania and Bulgaria. Previous agreements between the airlines of the countries — C.S.A., Lufthansa, Malev, L.O.T., Tarom and Tabso — had all been of bilateral nature. Services between the capitals of the signatory countries will, in future, be operated according to a jointly drawn up plan.

● **T.W.A. interest in Viscounts :** Howard Hughes and a team of Trans World Airline experts met recently in Montreal with Trans-Canada Air Lines Vice President H. W. Seagram to discuss the Vickers *Viscount.* T.W.A. is said to be moving fast to pick up an order for 15 *Viscounts* cancelled several weeks ago by Capital Airlines because of financial difficulties. It is believed that T.W.A. is asking for 14 percent discount on the quoted $1,200,000 per aircraft, in return for taking them off the company's hands. According to press reports from Paris, Howard Hughes, the majority shareholder of T.W.A., is considering the purchase of SE.210 *Caravelles,* and, perhaps later, the production of these aircraft.

● **Trans World Airlines** is planning an extensive campaign to persuade at least 25,000 Britons to fly to the United States for their holidays next year. Another of the campaign's objectives will be to counteract widespread reports that the £100 allowance in dollars, recently authorized by the British Government, is inadequate for a visit of two weeks or more to the United States.

● **Seaboard & Western Airlines** flew 10,931,524 ton-miles in its first full year of scheduled transatlantic all-cargo service (May 1st, 1956-April 30th, 1957). This represents a 63 percent increase in freight traffic over the comparable 12-month period when Seaboard operations were on a non-scheduled basis.

● **Compania Cubana de Aviación SA** has announced an order for two Boeing 707 jet transports, with an option to acquire a third.

● **Philippine Air Lines** will reopen its regular service between Tokyo and Manila next October, in accordance with a two-year expansion and development programme, *Interavia* Tokyo Correspondent reports. The frequency of flights between Manila and Hong Kong is also to be stepped up. The company hopes to introduce Vickers *Viscounts* on the Tokyo route. (An order for two *Viscount* 770Ds was placed in the spring of 1956.)

● **The Philippine Civil Aeronautics Administration** has announced plans to modernize the country's airports and to improve air navigation facilities. The Government has authorized the issue of U.S. $4,000,000 worth of bonds to finance the initial construction of new runways, terminal buildings, control towers and aeronautical communication facilities at the Manila terminal and at airports in the southern Philippine islands of Mindanao, Negros, Panay, and Cebu. It is estimated that development of Manila's international airport will require

U.S. $5,000,000. A large new terminal building is to be erected, and concrete runways capable of accommodating jet airliners will replace the old asphalt runways.

● **The International Council of the Aeronautical Sciences,** which was founded in Paris on May 30th, will hold its first congress in September 1958, in Madrid. The U.S. Institute of the Aeronautical Sciences, 2 East 64th Street, New York 21, N.Y., is acting as the permanent secretariat of I.C.A.S. and is providing the operating staff.

● **Telefunken G.m.b.H.,** acting under contract to the Federal Institute for Air Traffic Control (Bundesanstalt für Flugsicherung), is building three new type radar installations which will have a range of up to 270 n.m. (500 km) and cover altitudes of up to 75,600 ft. (23,000 m). To be completed by the spring of 1958, the installations, which will have 25-ton radar aerials, are destined for the Munich, Frankfurt and Hanover areas.

● **The Fairey Aviation Co.** has appointed C. W. Hall, a half-brother of the late Sir Richard Fairey, as Chairman. Hall, who retains his appointment as Managing Director of the company, was elected Acting Chairman following the sudden death of R. T. Outen in February last.

● **Lear Incorporated** has been awarded a $5,000,000 Air Force contract for the three-axis damping systems for the Lockheed F-104 *Starfighter*. According to Richard M. Mock, President, the company's order backlog as of May 31st, 1957, amounted to approximately $63,635,000.

● **Fairchild Engine & Airplane Corporation** has announced expansion projects which will provide more than 175,000 sq.ft. of plant space at three major divisions. The Aircraft Division at Hagerstown, Maryland, will get a new Propulsion Test Laboratory required for testing in connection with the *Goose* Weapons System project ; an Adhesive Bonding Building for processing Metlbond and Redux in connection with the B-52 and F-27 projects ; and a Tool Storage Building. At the Engine Division, a 34,000 sq.ft. engineering office is to be built. Already under construction at the Engine Division is a Research Laboratory, to be completed by July 1st. The expansion of the Stratos Division plant, to be completed by October, will give that Division an additional 23,300 sq.ft. of floor space for production and for new engineering laboratories.

● **Westinghouse Electric Corporation** has received a contract totalling approximately $10,000,000 from the U.S. Navy for the development and manufacture of a complete experimental launching system for the *Polaris* ballistic missile. The order will be executed by Westinghouse's Sunnyvale, California, division.

● **Pilot Vertigo** is one of the prime causes of aircraft accidents, according to a report made to the 106th annual meeting of the American Medical Association in New York City. According to Dr. James B. Nuttall, of the U.S. Air Force's Office of the Surgeon General, who prepared the report. pilots who lose their sense of " up and down " in space account for 14 percent of fatal accidents in one overseas command. An analysis of all major aircraft incidents in the Air Force revealed that disorientation of the pilot is involved in more than 25 percent of accidents in which physical, physiological and pathological factors are implicated. This disorientation is caused in the first place by the unavoidable accelerations of air flight, and little can be done except to train the pilots better. At the same session, Col. H. G. Moseley, of Norton Air Force Base, California, read a paper which analysed several thousand injuries in a large number of transport aircraft crashes. Of those seated facing front, 84 percent escaped injury, while 98 percent of those facing the rear came through unharmed, as did 94 percent of those facing sideways, Col. Moseley said. Moreover, the fatality rate was 11 times higher among the " front facers" than those seated facing the other two ways. Those who were standing were injured most often — only 79 percent escaping injury, but the fatality rate was only slightly lower than that of front facing passengers.

● **Louis Filiateau,** one of France's first test pilots, has died at Istres, at the age of 58. Filiateau had been test pilot for Amiot and later for SNCA du Nord. He was the first pilot to fly the *Spad* fighter aircraft which became famous in World War I. As a test pilot he logged some 8,500 flying hours.

Workshop Briefs

• Lockheed Aircraft Corporation plans to spend $ 5,850,000 on the flight testing of the first *Electra* turboprop transport. This aircraft will be completed in December 1957 and is scheduled to begin flight testing in January 1958.

• The first two-seat North American F-100F *Super Sabre* has been delivered to the U.S. Air Force's Air Training Command.

• The U.S. Army has awarded study contracts for a ballistic missile with a range of approx. 650 nautical miles to Chrysler, Ford, Martin and Northrop.

• Rolls-Royce gives the take-off thrust of the civil version of the *Conway* jet engine (RCo.10) as 16,500 lbs.

• Napier has bought a *Metropolitan* from Convair, San Diego, and plans to convert it for experimental purposes to *Eland NEl.6* 3,500 h.p. turboprops.

• First deliveries of Douglas WB-66Ds were made to Tactical Air Command, U.S. Air Force, at the end of June 1957. The WB-66D is the latest version of the twin-jet B-66 *Destroyer,* and is specially equipped for weather reconnaissance over the combat area.

• A new gas turbine, the Solar YT62, for use in a one-man helicopter now under development is announced by Solar Aircraft Co., San Diego. - Power 55 s.h.p. plus 12 lbs. residual thrust.

• The de Havilland *Sea Vixen* carrier-based fighter is to be fitted with in-flight refuelling gear as part of its standard equipment.

• Sud-Aviation's *Alouette II and Djinn* helicopters have been granted their type certificates, based largely on American certificate of airworthiness requirements. Certain changes had to be made in the requirements, however, as the American regulations do not yet cover turbine-powered helicopters.

• The first Hurel-Dubois HD.34 production model has so far completed 50 flying hours ; the second HD.34 began flight testing on May 29th, and the third model should have made its first flight by the time these lines appear in print. Eight HD.34s have been ordered by the French Institut Géographique National for aerial survey work, etc.

• The SNECMA 12T twelve-cylinder air-cooled piston engine has been certificated (to I.C.A.O. standards) for a power of 600 CV.

• A Potez 4 D 30 engine (240 CV with supercharger) has completed a 150-hour bench run to I.C.A.O. regulations. This engine is to equip the production Nord 3202 trainer and has also been selected for artillery observation aircraft now under development.

• Fleet indoctrination tests with the Lockheed T2V-1 *Sea Star* have begun, and carrier landing trials are to be carried out aboard the aircraft carrier *Antietam.*

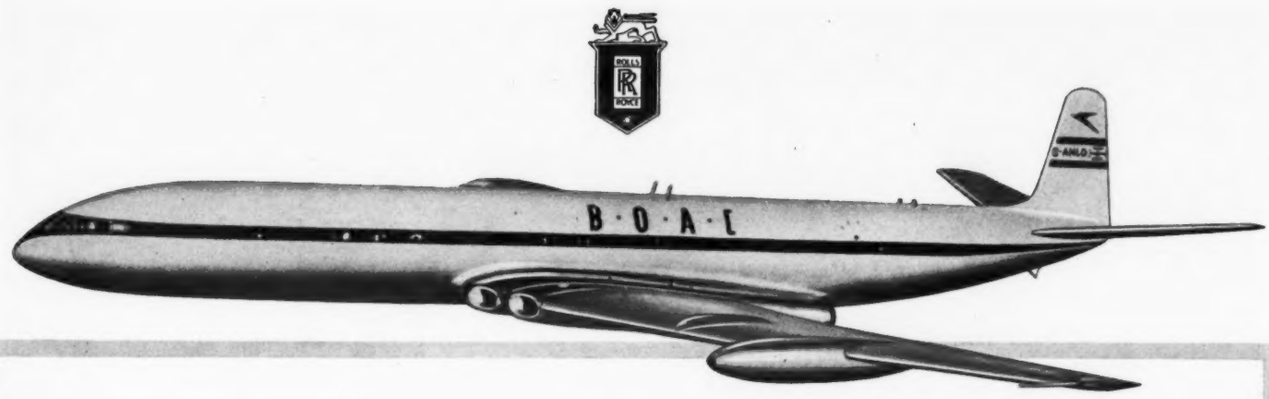
• The Raytheon/Northrop *Hawk* anti-aircraft missile is being prepared for tests. This weapon is particularly suitable for use against low-flying aircraft.

• A U.S. Navy contract for pre-production work on a new radar early warning aircraft derived from the L-1649A *Starliner* commercial transport is announced by Lockheed Aircraft Corporation. The aircraft, whose designation is W2V, will have four Allison T56 turboprops plus two Westinghouse J34 jets (in pods at the wing tips).

• The following ratings have been announced for British aircraft engines : *Double Mamba ASMD.8,* 3,600 s.h.p. + 710 lbs. thrust ; *Olympus 511,* 13,540 lbs. thrust ; *Olympus BOl.1/2A,* 9,750 lbs. thrust ; *Olympus BOl.1/2B,* 9,500 lbs. thrust ; *Olympus Mk.101 BOl.1/2C,* 11,000 lbs. thrust ; *Olympus Mk.102 BOl.11,* 12,000 lbs. thrust ; *Gyron DGy.1,* 15,000 lbs. thrust ; *Gyron DGy.2,* 20,000 lbs. thrust ; *Avon RA.26,* 9,500 lbs. thrust ; *Avon RA.16,* 9,000 lbs. thrust ; *Avon RA.26,* 10,000 lbs. thrust ; *Avon RA.28,* 10,000 lbs. thrust ; *Viper ASV.9,* 1,900 lbs. thrust ; *Tay RTa.1,* 6,250 lbs. thrust.

• A second prototype of the Leduc 022 ramjet research aircraft is in final assembly.

• The Fairey *Gannet* may be the last fixed-wing aircraft for anti-submarine duties used by the Royal Navy. Carrier-based helicopters are expected to take over these duties in the future.



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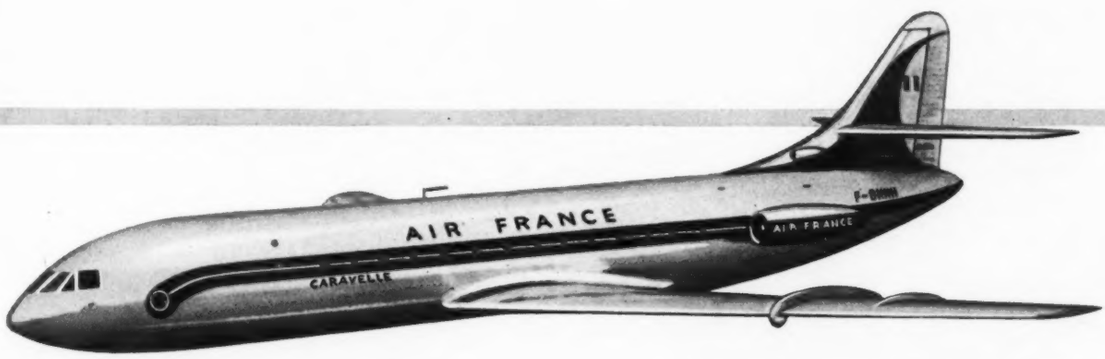
For the medium range jet airliner



Avon turbo jets power

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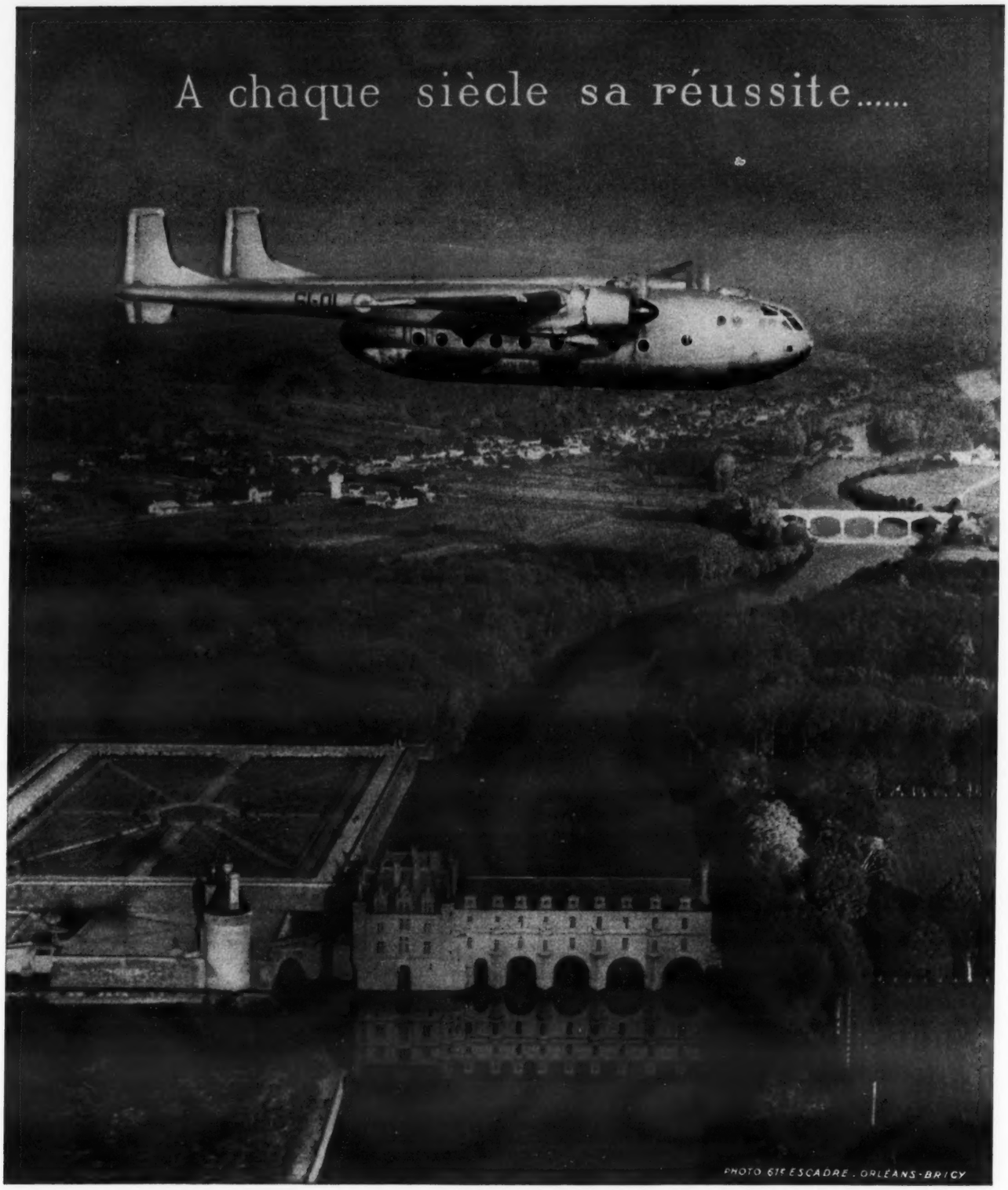

S.N.C.A.N

Société Nationale de Constructions Aéronautiques du Nord

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Mr. B. C. Monesmith, Vice President
Lockheed Aircraft Corporation
Burbank, California

Dear Burt:

Here are photos of our first trans-Pacific operation with our new Lockheed 1049H Super Constellations. It was a complete success -- we couldn't have handled this MATS contract with any other transport.

Four days later, here in the States, we carried a record commercial air cargo load -- flying 41,746 pounds of general cargo from Newark to Burbank.

The convertible cargo-passenger Constellation is just what our industry has long needed. We're getting profitable new business we couldn't bid before. We're now converting our long haul Flying Tigers fleet to 1049H Super Constellations.

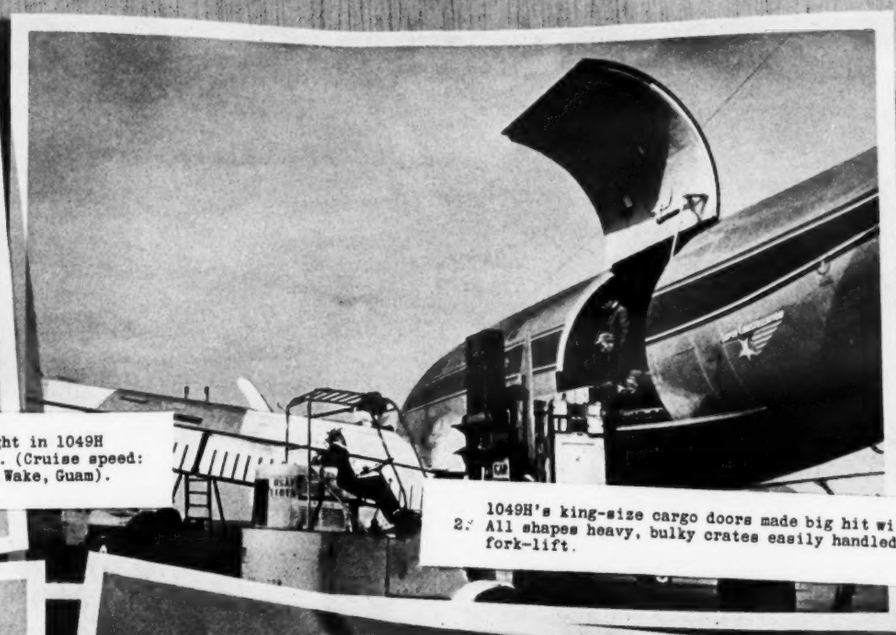
Best regards,

Frank B. Lynott

Frank B. Lynott
Vice President, Operations

5. Seats installed. Unloading and conversion took less than 10 hours -- while the flight crew logged a little sack time in Tokyo

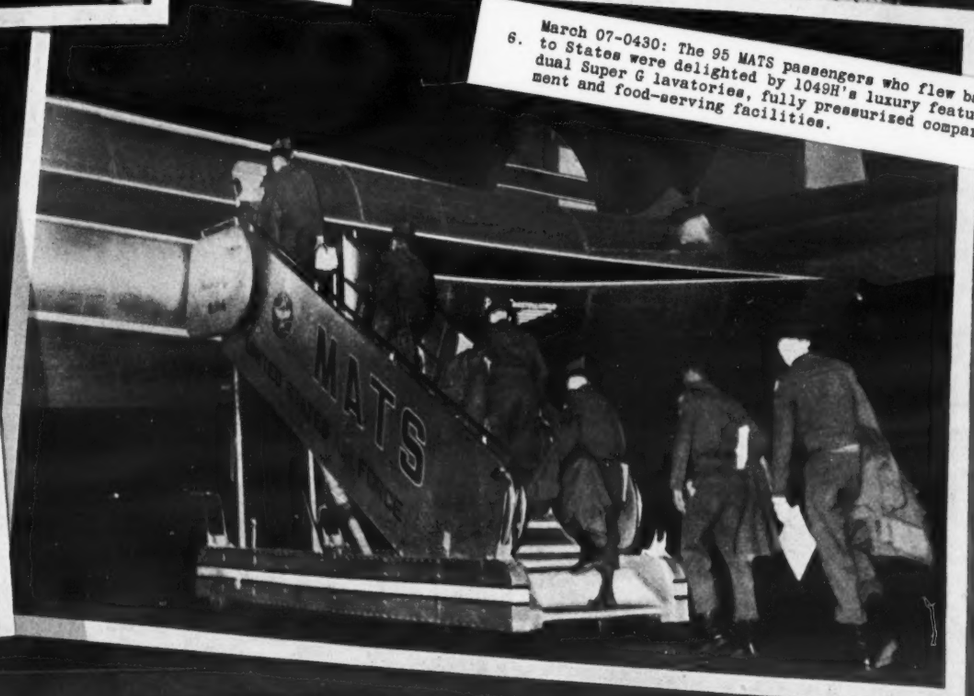
TOKYO, March 06-1830: First MATS flight in 1049H
1. Super Constellation ahead of schedule. (Cruise speed: 250/275 knots, refueling at Honolulu, Wake, Guam).



1049H's king-size cargo doors made big hit with crew.
2. All shapes heavy, bulky crates easily handled by fork-lift.

MATS cargo -- 20,500 lbs. -- unloaded in record time.
3. (A full 36,000 lbs. would have taken only a few minutes longer)

Main cargo compartment, clean as a bowling alley --
4. ready to install passenger seats (stowed in lower cargo compartment on Tokyo flight).



March 07-0430: The 95 MATS passengers who flew back
6. to States were delighted by 1049H's luxury features, dual Super G lavatories, fully pressurized compartment and food-serving facilities.

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U.S. Airlines and Aircraft Industry in Mid-June 1957

by Scott Hershey, New York

The old saying that the market will interpret any news to fit its current mood was demonstrated with reports of a recent indisposition of President Eisenhower. The market dipped sharply with the news, the tape running as much as 14 minutes behind. Then, with encouraging news from the White House, the list regained most of its strength and made up most of the lost ground by afternoon and closed with only moderate losses. Losses were almost general, however, among the aircrafts.

*

The market recently has been paced by oils, and *aircraft shares* for the most part remain under pressure due for the most part to defense spending cuts provided by Congress.

The Pentagon budget cutting, plus words of peace from Khrushchev and disarmament talk from London, all had their effect and caused some decline in aircrafts. Investment services were almost unanimous, however, that if any agreement is reached at the London disarmament talks, the first steps would be tentative and would involve no immediate cutback in military plane production. Any real disarmament still seems a very faint hope and even the first step looks a long way off.

Selectivity then remains an important factor in aircraft manufacturing stocks. As for some time past, individual manufacturers will experience variable results reflecting mixed trends in orders. Owing to the heavy dependence on military orders by most producers and the possibility of abrupt shifts as world conditions change, speculative characteristics rather than conservative investment factors are the dominant consideration. Prospects for profits in 1957 are for further gains for such companies as Boeing, United Aircraft, General Dynamics and some smaller concerns, but either no great change or lower earnings for certain others.

*

Interest in *airline shares* has been discouraged by uncertainty as to when the current cost price squeeze will end as well as the downturn taken in earnings in recent months.

" Many of the unfavorable developments appear to be discounted at current price levels and a modest price recovery for the group may take place in coming months when institutional holders complete their liquidations ", according to the current Security and Industry Survey of Merrill Lynch, Pierce, Fenner and Beane.

First quarter reports of U.S. domestic airlines, including their overseas operations, showed a gain in operating revenue in all cases, and a sharp drop in net operating income in all cases, with deficits reported by Capital, Northeast, Northwest, T.W.A. and Pan American. Total operating revenue for the twelve domestic lines was about $360,370,000. This compared with $316,067,000 for the first three months of 1956. Net operating revenue for the lines, however, was only $4,895,000 as against $18,224,000 in the 1956 period.

*

A significant move in airline financing recently was the listing on the New York Stock Exchange of K.L.M. Royal Dutch Airlines stock. With the ticket symbol of K.L.M., the stock opened at 35 1/2 and traded 5,200 shares, closing at 34 3/4. Prior to their listing on the Big Board, two blocks of stock were offered for public subscription simultaneously in New York City and Amsterdam. Together they totalled 400,630 shares, equal to about 28 % of those outstanding.

In negotiating the sale the managers of the investment syndicate headed jointly by Smith, Barney & Co., and The First Boston Corp., paid $27 a share with the offering to the public at $29 a share. In Europe, the former Government-owned shares were marketed on the Amsterdam Stock Exchange by a banking group headed by Heldring & Pierson, Pierson & Co., and The Netherlands Trading Society. Offering price of $29 a share represented a value approximately five times the airline's 1956 earnings.

*

There was over-the-counter activity in Transocean Corp. of California, operator of world-wide aviation enterprises, on announcement it will acquire Babb Co., Inc., wholly owned subsidiary of Atlas Corp. Subject to approval by the Civil Aeronautics Board and the Securities and Exchange Commission, Atlas will receive $3,000,000 in fifteen-year 5 1/2 % debentures, $3,000,000 in par value of 6 % convertible preferred stock and 200,000 shares of Transocean common which sold over the counter recently in the $8 to $9 range.

Babb has aircraft overhaul and maintenance facilities in three locations in the United States and Canada, and is a dealer in aircraft, engines, spare parts and equipment. Transocean is engaged in the same type of business on a larger scale, with bases in Europe and Asia as well as in North America. The company also operates a trans-Pacific cargo and passenger service and two airlines in the Mid-East.

Briefs

Chance Vought has filed a registration statement with the SEC for a proposed issue of $12,500,000 of convertible subordinated debentures due July 1st, 1977. Offering will be convertible into Chance Vought common through July 1st, 1967. Proceeds will be used to reduce bank loans incurred to finance increased inventory and accounts receivable. Debentures are the first public offering attempted by Chance Vought since it was " spun off " United Aircraft in 1954. United Aircraft first quarter earnings were up 26.1 % on a sales gain of 38.1 %. Net income was $10,976,663, equal to $2.03 each on 5,176,729 common shares outstanding ... National Airlines for the nine months ending March 31st reported net income of $2,350,685 or $2.25 a share, against $2,847,641 or $2.76 a share for a like period a year ago. Earnings dip was laid to the up spiral in labor and maintenance cost with no tariff increase, a familiar line in airline reports ... J. H. Carmichael, President of Capital Airlines, reported operating results of his line began to improve in April and the trend continued in May. Mr. Carmichael said the company had only deferred, not cancelled, its plan to acquire additional equipment including ten de Havilland *Comet IV* jet airliners ... Continental Airlines announced a revision of its accounting practices to conform with Securities and Exchange Commission requirements in connection with an offering of 230,000 common shares. Effect of the revision will be to reduce the reported net income for 1956 to $584,426 or $1.22 a common share, from $710,426 or $1.49 a common share. ... Delta Air Lines earnings from operations after depreciation charges probably will slip to between $2 and $2.25 a share for the fiscal year ending June 30th, 1957, from about $3.00 last year, Todd G. Cole, Financial Vice-President, has estimated. Mr. Cole attributed the slip to higher costs and " a slight decline in the passenger load factor ".

Airlines' Dilemma, as reported by the Wall Strett Journal : " They win if they lose—or vice versa. At least that's the way many lines view their request for higher fares. The C.A.B. will likely approve the request if earnings continue sour the rest of the year. Denial seems probable if earnings turn up. The dilemma deepens. One airline financial man says : ' We have to be optimistic with our bankers who will provide the money for new planes, pessimistic with the C.A.B.'. Actually, airlines don't expect 1957 to be a good year. If that develops 1958 will probably be a better earnings year—with higher fares."

INTERNATIONAL MEETINGS AND CONFERENCES

July 9-14th : FAI - Italy : International Aviation Week (Pescara Aero Club).

July 10-20th : International Plastic Exhibition & Convention. London.

July 11-13th : Royal Aero Club National Air Races.

July 12-13th : FAI - British Lockheed Trophy, International Aerobatics Contest. Baginton, Coventry.

July 22nd-August 3rd : Industrial Fair. Sydney.

July 27th-August 4th : 39th Swedish Samples Fair. Malmö.

July ...th : IATA - Preparatory Meeting to ICAO SAM/SAT Regional Air Navigation Meeting. Rio de Janeiro.

Aug. 5-10th : IAS - National Naval Aviation Meeting. San Diego.

Aug. 18-25th : FAI - Yugoslavia : " Coupe Adriatique " International Parachute Contest (Union Aéronautique de Yougoslavie). Tivat-Boka Kotarska (Montenegro).

Aug. 20th-Sept. 20th : 26th International Fair. Izmir.

Sept. 1st-5th : International Autumn Fair. Frankfurt.

Sept. 1st-8th : Autumn Fair. Leipzig.

Sept. 1st-15th : RAES IAS : 6th Anglo-American Aeronautical Conference. London & Folkestone.

Sept.1st-22nd : 22nd International Fair. Thessaloniki.

Sept. 1st-30th : 4th International Fair. Damascus.

Sept. 2nd-8th : SBAC - Society of British Aircraft Constructors Exhibition and Flying Display. Farnborough.

Sept. 2nd : IATA - Legal Committee. Estoril *.

Sept. 5th : IATA - Executive Committee. Madrid.

Sept. 7-25th : 21st International Levante Fair. Bari.

Sept. 8th : Stuttgart Aviation Day (with Industrial Show on Sept. 7th). Stuttgart.

Sept 8-15th : 66th International Autumn Fair. Vienna.

Sept. 9th : IATA - 13th Annual General Meeting. Madrid.

Sept. 10th : ICAO - Communications Division, 6th Session. Montreal.

Sept. 10th : ICAO - Legal Committee, 11th Session. Tokyo.

Sept. 13th : IATA - Executive Committee. Madrid.

Sept. 14-29th : INTERBAU 1957 - Industrial Exhibition. Berlin.

Sept. 15-24th : European Machine Tools Exhibition. Hanover.

Sept. 23rd-25th : ASME - American Society of Mechanical Engineers, Fall Meeting. Hartford, Conn.

Sept. 24th : IATA - Composite and Joint Meeting of Traffic Conferences. Miami.

* Provisional.

Paris Sidelights

They shall not pass . . .

... On every gate at the Salon a large board proclaimed a multiplicity of entrance passes, tickets, badges, etc. One morning our good friends Clifford Hollowell of Napier and Peter Hering of Westland drove in at a gate with a car without admittance labels. They were solemnly stopped by an *agent de police* who demanded to see their pass. On the spur of the moment, Peter handed him a pink card inscribed with the words " This is to certify that Peter Hering is a member in good standing of the indoor bird watchers society ". On the reverse side indications were given of the types of birds found indoors (such as the Emerald Throated Dowager and the Extra-Marital Lark). The *agent* closely scrutinized this for a moment, then sprang smartly to the salute and opened the gate. Peter and Holly drove on up to the exhibition hall...

... Bill Bedford wanted to do a trial flight in the *Hunter T.7* Friday, before the flying display. After much palaver, flying control gave him permission before 7 a.m. or after 8 p.m. and also cleared him to drive round the airfield to his aircraft. Halfway round he was stopped by a policeman who refused to listen to anything and promptly relieved him of both taxi and driver (fate unknown). Back went Bill to find another taxi and then off again to the aircraft. Alas, another policeman appeared and the rigmarole started all over again. Bill finally made it and his display next day was one of the highlights...

... Another pilot who nearly did not take part in the display was Roy Bradley of Westland. Complete with authorization papers and pilot's armband, he proceeded across to the *Whirlwind* to give his display to the massed crowds on Sunday. Unfortunately the police thought otherwise and refused to let him through. In the end in desperation he had to drag the chief controller down from the control tower to get him through...

Wartime adversaries meet on the same stand

... On the English Electric stand in the exhibition was Carl Francke, who is the agent for Napier aero engines in Western Germany. When he first went to Napier last summer he found quite by accident that he had something in common with Commander Torry, of Napier sales. In September 1939, when World War II was in its infancy, the British Home Fleet was exercising in the North Sea. Coastal Command aircraft were cooperating. Suddenly one of the " cooperating " aircraft turned into a then very hush-hush Ju-88, which proceeded to dive on the *Ark Royal* and achieved two near misses, much to the consternation of those on board. That evening two gentlemen called Hitler and Goebbels decided two near misses added up to one carrier sunk. In blissful ignorance the *Ark Royal* steamed steadily on through the North Sea. Carl Francke was the name of the Ju-88 pilot and Torry the name of the C. O. of 800 Squadron on board the *Ark Royal*...

The Press on the track of the Tu-104

... Every evening a Russian engineer in dark blue Aeroflot uniform sealed up the Tupolev Tu-104's two jet engines, sticking dozens of strips of paper over the nacelle covers. Each strip of paper bore the date and the name of the engineer. Needless to say, such precautions set the Press moving.

While the most contradictory rumours were circulating in the Press Tent on the technical features of the Russian jet transport, a number of privileged visitors — including a member of *Interavia's* editorial staff — were given the opportunity of making a closer inspection of the aircraft. A first cursory examination revealed that the airframe — SSSR-L 5423 — was built in 1956 and was, to judge from the riveting, a production model. Surprisingly enough, two of the tyres on the right-hand undercarriage bore the dates 1953 and 1954, suggesting that they had been taken from a *Badger* bomber. It was discovered that the vertical slots at the wing tips are designed to exhaust compressed air so as to improve circulation at the wing tips. Their object is to prevent premature flow break-away at the wing tips in slow flight at a high angle of attack.

Several French engineers and one American navigator were even permitted to see the engines without covers. They all agreed that the jets could not have more than five or six compressor stages. In any case, they are straight jets and not, as frequently speculated, by-pass engines. Rev. speed is probably only about 60 % of the figure at which Western turbojets of comparable power operate. The absence of very high whistling noise on take-off would seem to confirm this assumption.

It will be interesting to see what the Press makes out of these meagre observations. The Russian crew at any rate refused to be drawn, and the smart Aeroflot hostess replied to all questions, pleasantly but firmly, with the words : *Monsieur le commandant not here... official conference.*

• **International Congress of Aeronautical Scientists in Paris.** During the 22nd Paris Air Show the Office National d'Etudes et de Recherches Aéronautiques, the Union Syndicale des Industries Aéronautiques and the Association Française des Ingénieurs et Techniciens de l'Aéronautique organized an International Congress of Aeronautical Scientists, an account of which, by Jules Jarry, AFITA Chairman, will be published in the August issue of *Interavia.*

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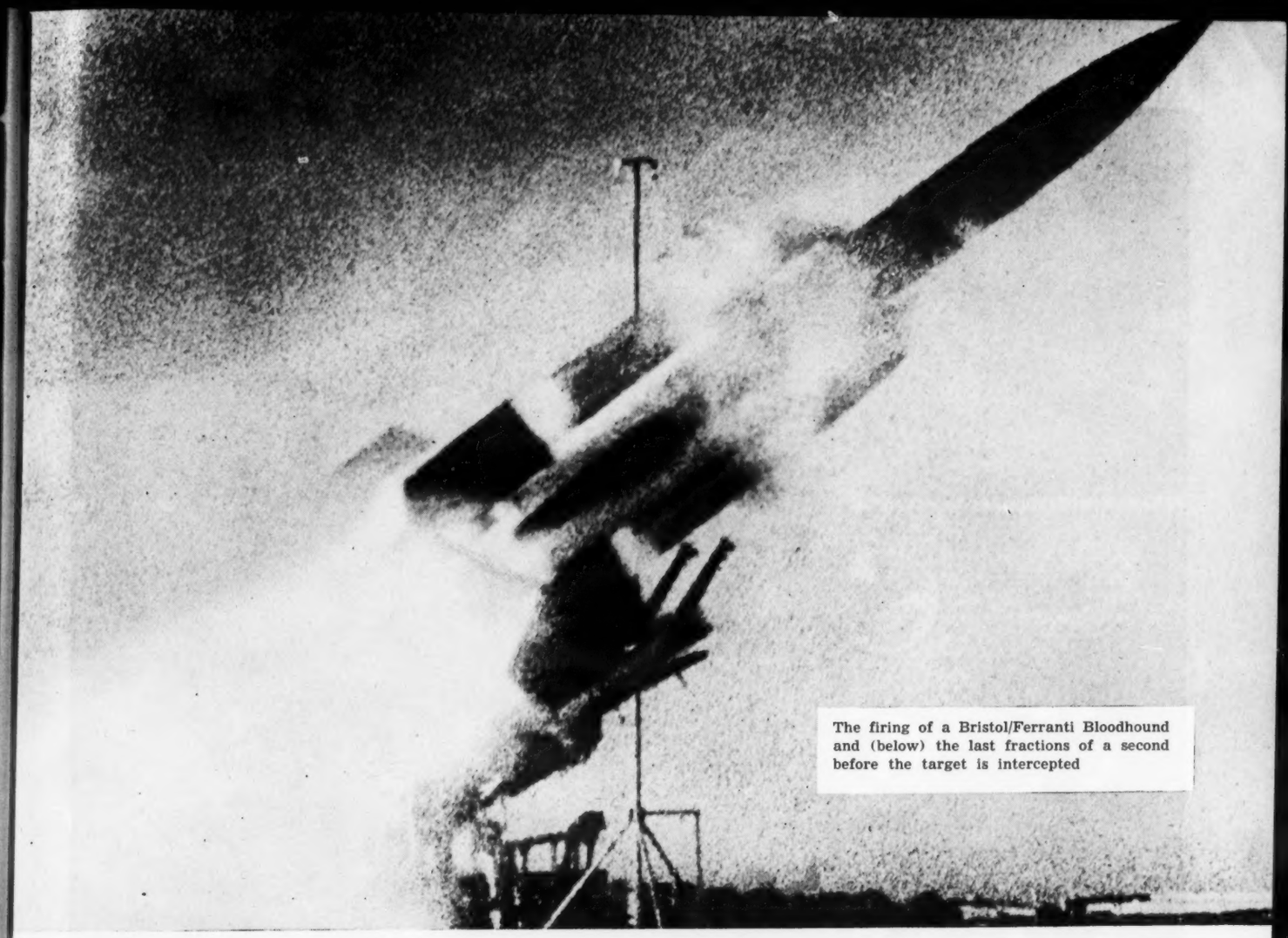

The firing of a Bristol/Ferranti Bloodhound and (below) the last fractions of a second before the target is intercepted

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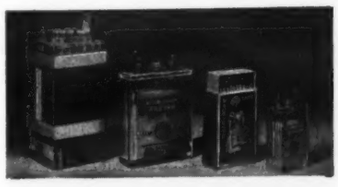

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Photo J. BUTLÉ

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Typical of the way Northrop plans military aircraft for specific needs is the design for the new T-38 supersonic jet trainer for the U.S. Air Force. Northrop's lightweight, low-cost training airplane, capable of operating from runways less than one thousand meters in length, is the first member of an entirely new family of supersonic military aircraft based on an economical design concept.

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The supersonic T-38 trainer, as well as the Snark SM-62, world's first intercontinental guided missile, is a product of the research, development and production teams at Northrop. A pioneer and leader in America in the development of all-weather and pilotless aircraft. Northrop continues to work, in cooperation with the United States Air Force, to contribute significantly towards the defense of the free world.

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Around the World

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19 airlines have ordered Boeing 707 or Douglas DC-8 transports with Pratt & Whitney Aircraft jet engines

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Pan American-Grace Airways
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Trans World Airlines
United Air Lines

Volume production of the JT4 engine—most powerful in the free world—is under way at Pratt & Whitney Aircraft. Rated in the 15,000-pound thrust class, the JT4 will power a majority of the Boeing 707 and Douglas DC-8 jet airliners ordered by the leading airlines of the world.

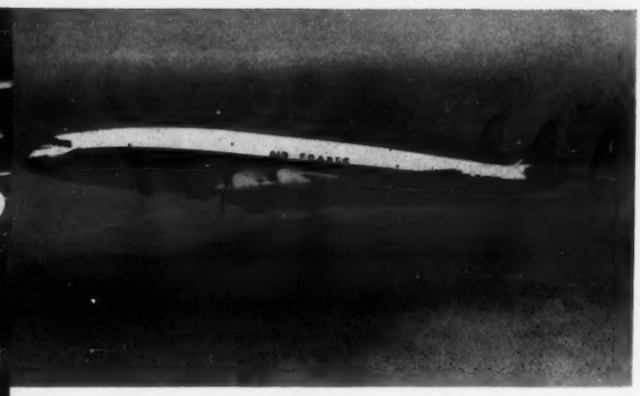
Recently certified by the U.S. Civil Aeronautics Administration for airline use, the JT4 is the commercial version of the J-75, which will power a number of high performance military aircraft. These include the Republic F-105 fighter, production models of the Martin P6M seaplane and other aircraft yet to be announced.

The JT4's basic configuration stems from the successful twin spool, axial-flow design of the famed J-57 and JT3. Despite its 50 per cent increase in thrust, the JT4 is only slightly larger than the JT3, with a lower specific weight and outstandingly low specific fuel consumption.

U.A.T AEROMARITIME

FRENCH AIRLINES PREPARE FOR JET AGE: The most recent jet airliner orders are those of the French independent lines, Transports Aériens Intercontinentaux and Union Aéromaritime de Transport, which both have ordered Douglas DC-8s with Pratt & Whitney Aircraft JT4 engines. Meanwhile, Air France has increased to 17 its order for Boeing 707s. These also will be equipped with JT4 engines.

with United Aircraft



NEW PROPELLERS specifically designed for advanced versions of the Lockheed Super Constellations are being produced by Hamilton Standard. To meet increased gross loads, the hub and solid aluminum alloy blades have been strengthened. Airlines using the new propeller, designated 43H60, include Air France, Air India, Avianca, Cubana, Iberia, KLM, LAI, LAV, Lufthansa, TAP, Thai Airways, and Varig, in addition to U.S. operators.

COMMERCIAL helicopter operators are now receiving deliveries of 12-passenger Sikorsky S-58s. The two S-58s illustrated were ordered by Humble Oil and Refining Co. to fly between shore bases and oil drilling platforms many miles out in the Gulf of Mexico. They speed the transportation of personnel and priority cargo, replacing slower surface craft. Sikorsky S-58s now provide scheduled passenger service in Belgium, France, Netherlands, and Germany, and in the United States.

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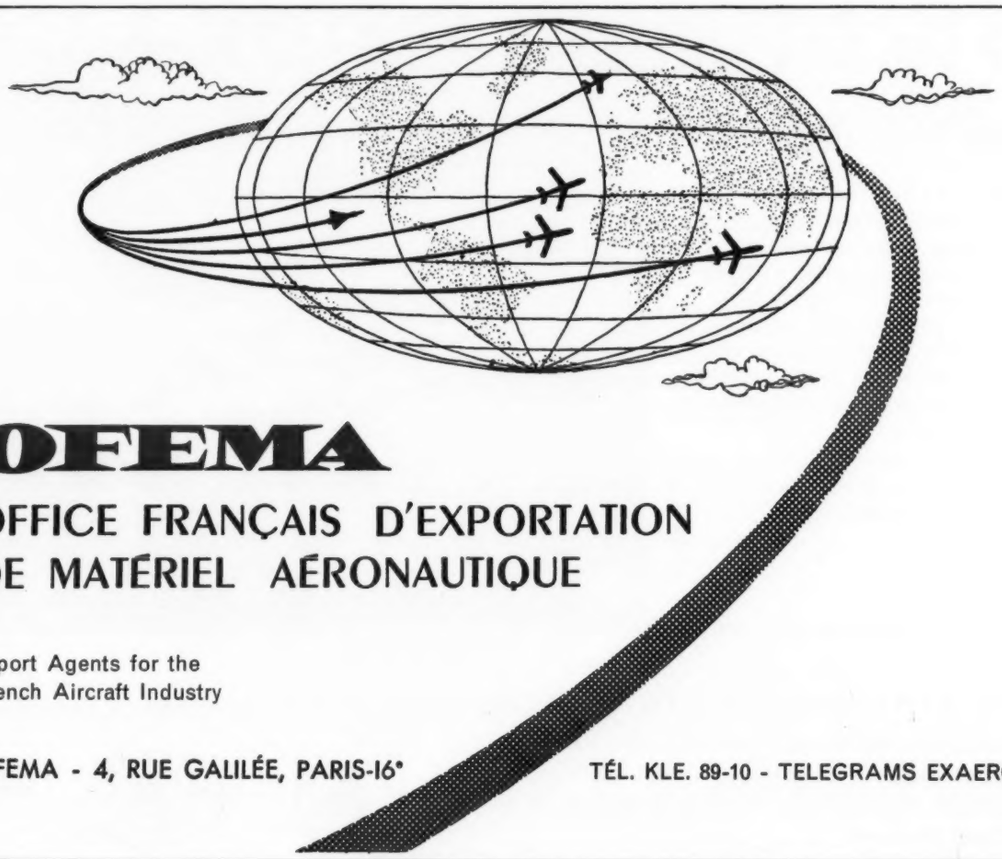

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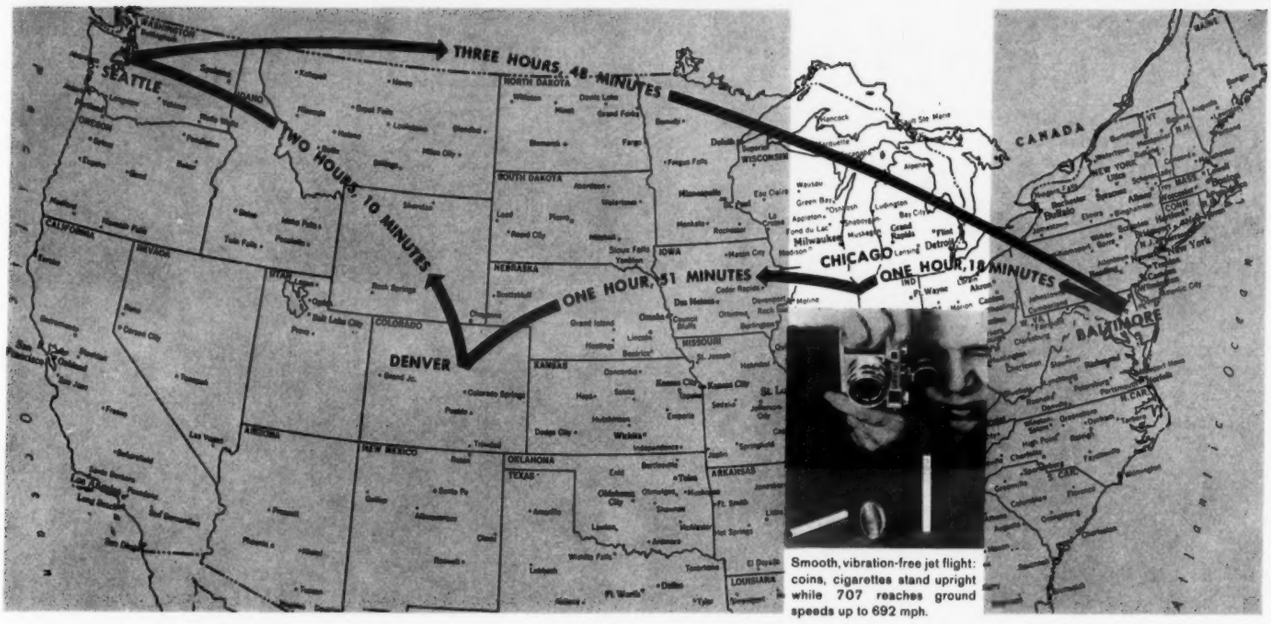

In the only American jetliner now flying – the Boeing 707 – newsmen recently flew coast-to-coast in 3 hours, 48 minutes, a new transport record. The report on 707 jet flight: Quiet. Smooth. Exhilarating!

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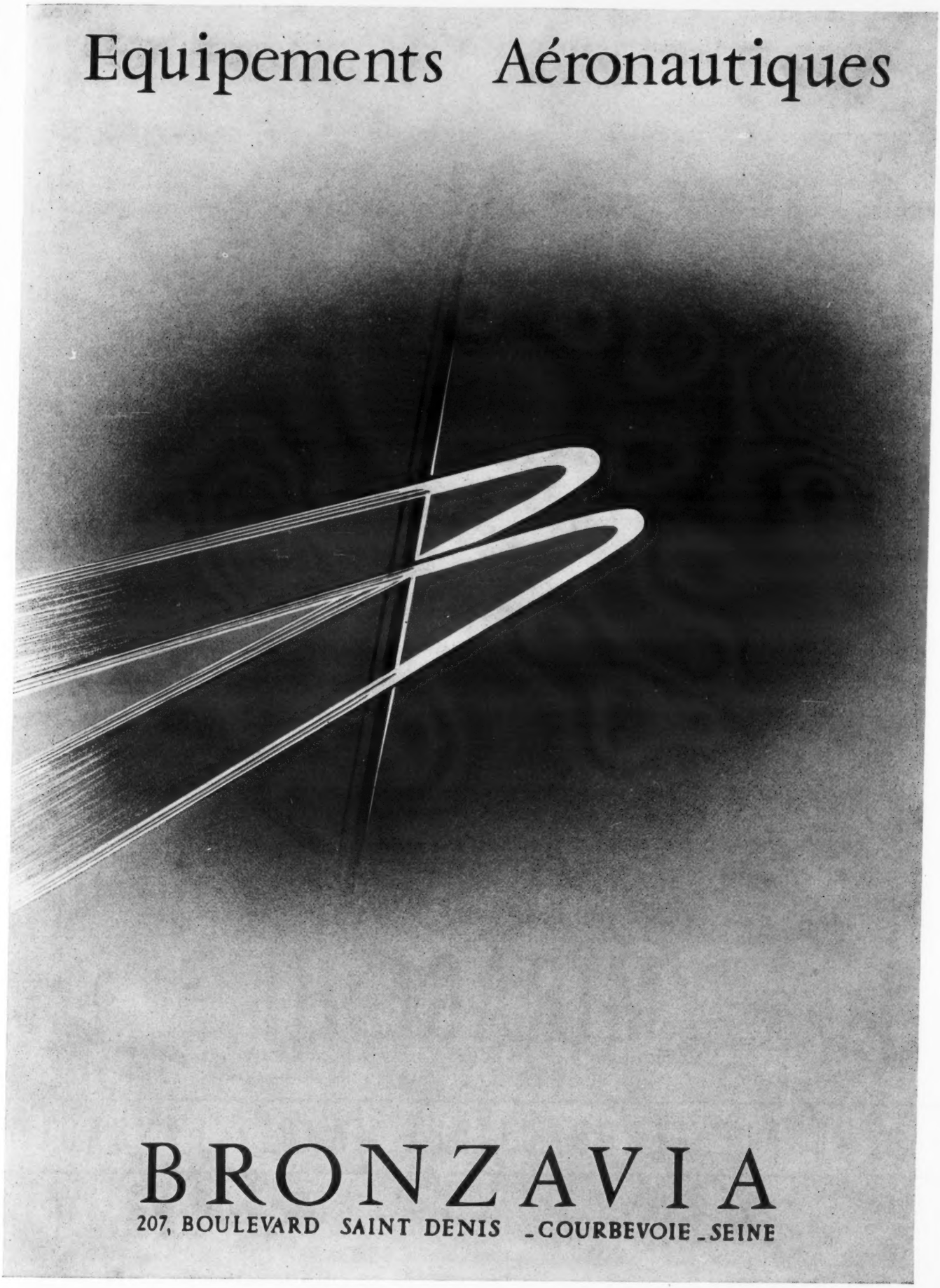

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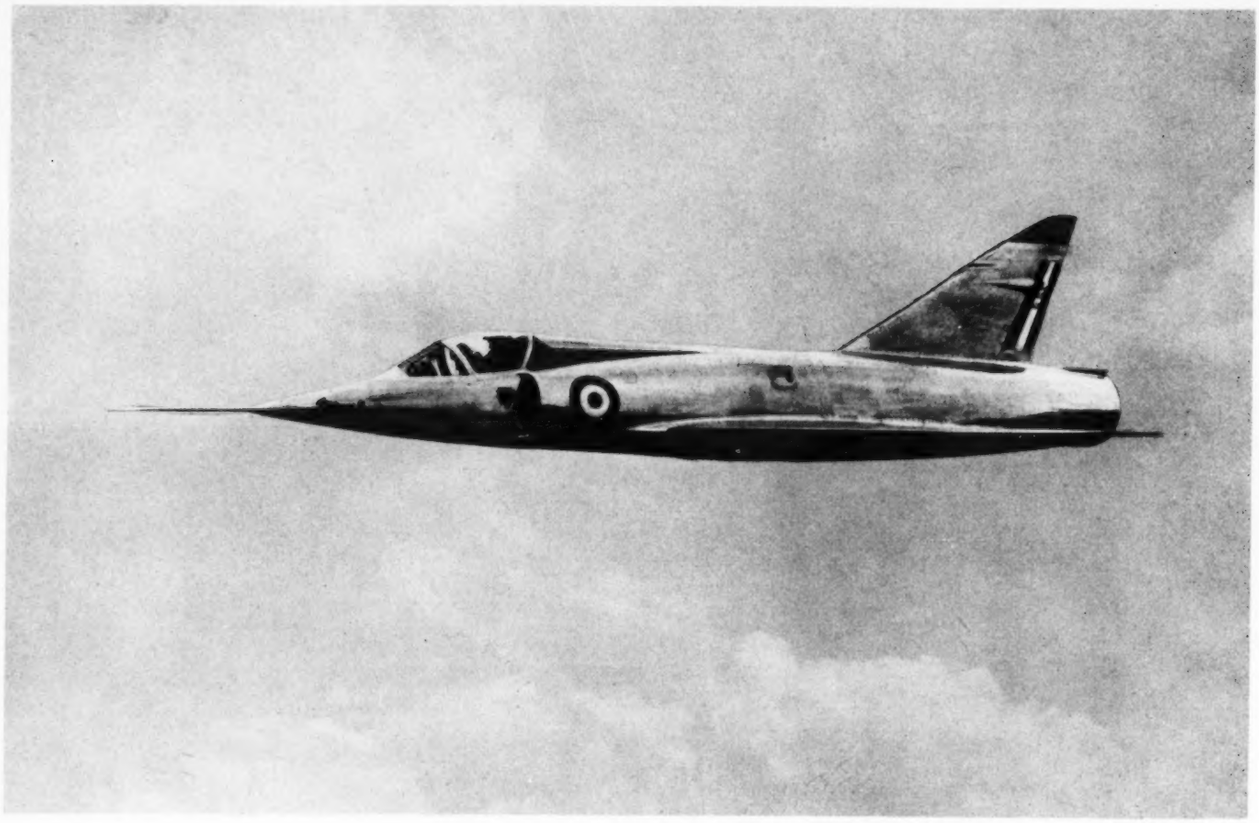

MIRAGE III

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AUTO DIRECTEUR A I ·1574 B I 0·256 C I ·45
TEMPS T 10·28
COORDONNEES X 1550·1832 Y 250·1899 Z 385·662
VITESSE X· 307·245 Y· ·618 Z· ·247
ACCELERATION X II ·452 Y II 0·002 Z II ·065
AUTO DIRECTEUR A I ·1571 B I 0·251 C I ·44
TEMPS T 10·29
COORDONNEES 1553·2934 Y 250·1977 Z 385·7725
VITESSE ·247 Y· ·719 Z· ·234
ACCELERATION X I ·451 Y II 0·001 Z II ·067
AUTO DIRECTEUR A I 74 B I 0·18 C I ·51
PS T 10·30
COORDONNEES X 155 2585 Z 386·4425
VITESSE X· 307· 49 Z· ·342
ACCELERATION X II ·42 4 Z II ·066
AUTO DIRECTEUR A I ·1536 0·8 C I ·53
T 10·31
COORDONNEES X 1557·6051 Y 250·3747 Z 386·5117
VITESSE X· 307·845 Y· ·701 Z· ·351
ACCELERATION X II ·374 Y II 0·006 Z II ·066
AUTO DIRECTEUR A I ·1478 B I ·14 C I ·54
TEMPS T 10·32
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VITESSE X· 307·945 Y· ·915 Z· ·
ACCELERATION X II ·328 Y II 0·003 Z II ·065
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TEMPS T 10·33
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VITESSE X· 308·002 Y· ·936 Z· ·306
ACCELERATION X II ·334 Y II 0·004 Z II ·065
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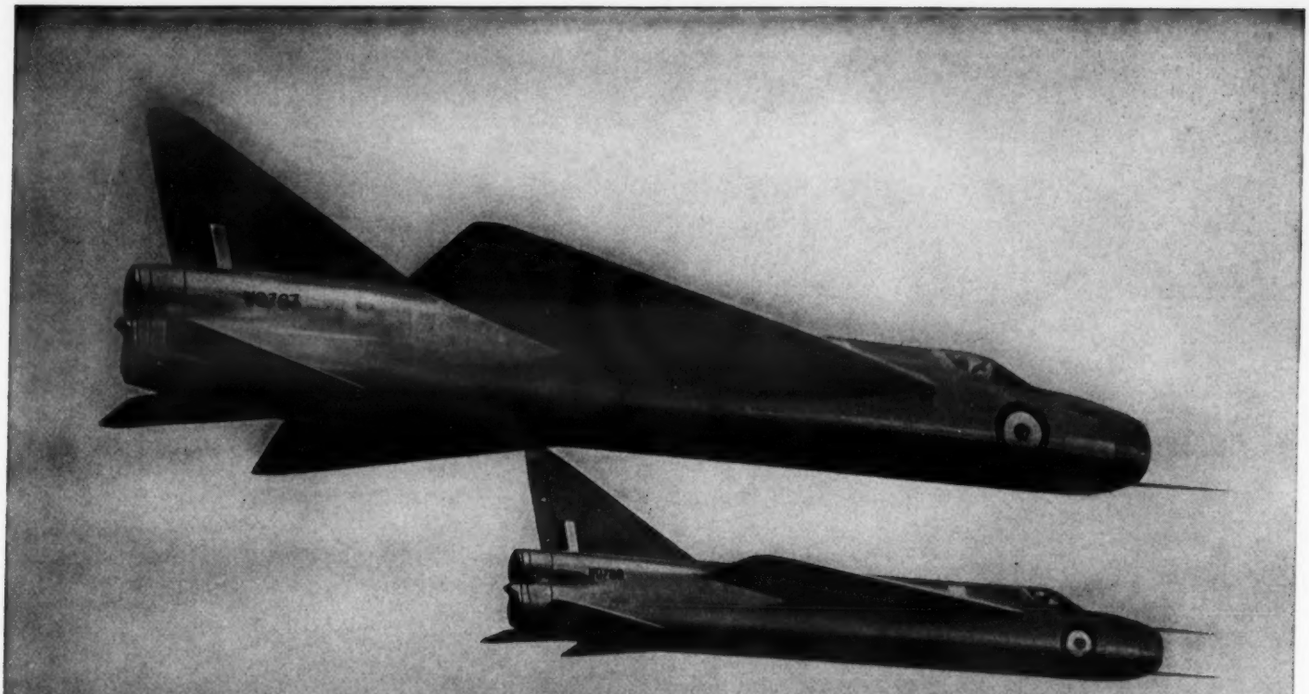

FORETASTE OF TOMORROW

The English Electric P. 1, Britain's first fully supersonic fighter, is destined to follow present day fighters into squadron service with the R. A. F. and a production order for it has already been placed.

THE

'ENGLISH ELECTRIC'

P.1

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Paris was Almost Too Hospitable . . .

Suddenly he stood before me. *Without* him a Paris Air Show would have been barely thinkable. For he is one of those veteran aviators who made every airfield and every show a dangerous place in the first decade of the century. ". . . *Mon cher ami,* you don't seem to realize that the Paris Air Show is much less concerned with aviation than with the Montmartre nightclubs . . ." Such comments have always been something of a speciality of his and are not to be taken too literally. Despite his 70 years, he still made a very active impression, even if he did lean heavily on his stick and complain that his "cognac pump" didn't work so well any more.

Nevertheless, he had to admit that—with all due respect to the old flying days—some progress has been made, not only on the stands at the Salon, but even in flying itself. After all, there were 14 countries represented at Paris—some of them admittedly only symbolically. Even the Iron Curtain had been lifted a little, to allow the Russian Tu-104 jet transport and several products from Poland and Czechoslovakia through. The British, understandably enough, were sparing with their new designs, which they are naturally saving for their own display at Farnborough later in the year. Nevertheless, they produced their traditional brilliant show of engines and equipment. The Dutch and Swedes reminded visitors that their aircraft industries are by no means negligible. And the Germans? Though they were present in force, this does not mean that there is yet a German aircraft industry capable of competing with its sisters in other countries. In the meantime, the President and the Secretary General of the Federal German Aircraft Industry Association made up for the absence of production items with disarming smiles. A dominant position among the foreign exhibitors was held by the Americans, though the Italians also showed that they are by no means asleep. The Canadians, too, revealed something of the financial and industrial resources which they have harnessed between Montreal and Vancouver.

As for France, the host country, a whole volume could be written on its achievements. During the past eleven years since the 1946 Salon France's aircraft industry has definitely made up for the ground it lost during the war. Even leaving aside such striking designs as the *Caravelle* and the *Flying Atar,* the demonstrations of new supersonic interceptors, with delta or other wings, of light-weight fighters for ground support missions, and the products of the French electronics and equipment industry could not fail to impress. France is certainly not preparing to abdicate as a Great Power in the air.

*

This 22nd Paris Air Show was an undoubted success. Some visitors may perhaps object that the scene is still dominated by aircraft, with rockets and guided missiles still taking a back seat. No doubt security regulations are in part responsible for this state of affairs, though the organizers had also obviously been motivated by the desire to retain the Salon's nature as a buyers' fair and to impress—all too strongly for some tastes—the people of Paris. Indeed the Parisians overran both the exhibition building and the outdoor show from the first day to the last.

The writer has sometimes been reproached for his public expressions of sympathy for France, which he made no attempt to conceal even during the French aircraft industry's difficult years. This sympathy may excuse him today for making a few suggestions to his French friends, even if some of his remarks contain a small degree of criticism.

At an international show of the standing of the 22nd Paris Salon, at which fourteen countries are represented, some allowance should be made for the fact that exhibitors wish to discuss their products with interested visitors in peace and quiet. But this was not always possible in Paris this year, as the Salon was open to the general public from first to last. It is excellent from the educational point of view and certainly of value to the future of aviation to conduct whole classes of schoolchildren through the exhibition. It speaks highly of the technical interest among France's workers, when whole families, complete with children, dogs and picnics, spend their spare time at Le Bourget. But . . . as at Farnborough, it would surely be better to reserve, say, the first or the last four days and the first of the flying displays for the aviation world. Only then could French or foreign exhibitors justify the heavy expense involved in participating in the Show, beginning with the rent of the stands and the necessary presence of a large number of staff, and ending up with the inevitable cocktail parties.

Surely, too, it should be possible to reserve some place, such as the President's Tent at Farnborough, where exhibitors could talk in reasonable comfort with their customers and other visitors.

In a city like Paris, with its high reputation for good food, it should be easy to provide the "professionals" with a slightly more comfortable and elegant restaurant than the hut opposite the exhibition building, which can scarcely be described as a worthy representative of French *cuisine.*

It is extremely hospitable of the Association of French Aircraft Manufacturers to invite its guests at the end of the Salon to an open-air supper in the Bois de Boulogne, with cold buffets, rivers of champagne and a firework display as the crowning glory . . . it must be difficult to prepare the list of guests for such an occasion without offending anyone. The space available would have been ample for 1,500 to 2,000 people, and it would then have been possible to enjoy the beauties of the Bagatelle's gardens. But with something like 5,000 persons present, the whole affair inevitably began to resemble feeding time at the zoo.

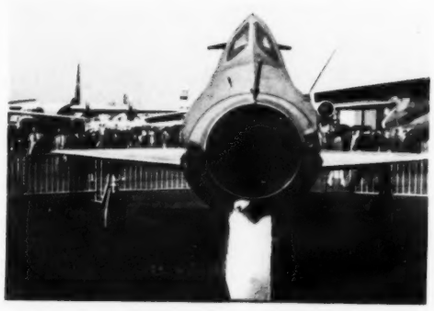
It is certainly not ingratitude which moves the writer to such frank statements, but an earnest desire to make some useful contribution to the 23rd Paris Air Show in 1959.

*

Justice demands, meanwhile, that unstinted praise be expressed for the organizers of the two flying displays, the first of which was attended by probably 100,000 visitors, and the second by nearly 300,000. Never has the timing of such a mass demonstration been better; never have traffic arrangements functioned more smoothly. One of the most impressive sides, though perhaps scarcely noticed by the general public, was the safety precautions taken for both pilots and spectators. By the hangars in the rear stood a column of vehicles belonging to the fire service, the ambulance service, police and the police helicopters. They remained there, fully manned and at the ready, for hours on end, in constant radio communication with the control tower. Had the need arisen—which fortunately it did not—it would have taken only a word for the whole safety apparatus to go instantly into action. Congratulations!

Long live the International Paris Salon. *EEH*

The Public Flying Display at Le Bourget



From the touring aircraft (the Czech *Meta Sokol*) to the supersonic fighter (French *Gerfaut*) . . . nothing is missing

Showing the American flag: During their Golden Anniversary the U.S.A.F. appeared in Paris in strength. Here the Northrop SM-62 *Snark* guided bomber, flanked by a single-seat and a two-seat North American F-100 *Super Sabre*.

The Parisian public will always love an air display. Before the war it packed itself into a dense crowd around the minute field at Vincennes, stoically swallowing the clouds of dust raised by the Fieseler, Doret or Détroyat aircraft participating in the epic aerobatic championships. At the end of the meeting, there was a general surge towards the Metro and the buses by spectators replete with sun, dust and powerful emotions; many an eye was still misty at the memory of the "bird man" crashing to the ground, having tried in vain up to the last second to open his parachute, or the Portuguese pilot Placido d'Acunha d'Abreu losing his wings when venturing on too sharp a pull-out at low altitude. The meeting was regarded as a circus where people went for spine-chilling stunts, and where they generally got their money's worth.

Similar, if not greater, enthusiasm, was shown for the air display at Villacoublay, where the Parisian public went to admire the French Air Force's aircraft and crews. Here individual feats gave way to collective exercises whose most prominent feature was discipline. A note of comedy was introduced by the blunderings of student-pilot Ademai who put his own interpretations on his instructor's orders (broadcast to the crowd by loudspeaker); needless to say, these "blunderings" were the work of a master pilot . . .

Since the war, Vincennes and Villacoublay have been worthily succeeded by the Flying Display at Le Bourget; the same crowd throngs it and even finds there an additional attraction, namely the opportunity to see the aircraft on the ground, to touch them and climb inside them.

A U.S. Air Force Fairchild C-123B *Provider* assault transport invites inspection.

Atar Volant pilotless VTO vehicle and Miles HDM.105 high-aspect-ratio-wing cargo aircraft (foreground) with the Hurel-Dubois HD.34 survey aircraft in the rear.

The Nardi FN.333 amphibian was exhibited by Fiat.

The Polish SM.1 helicopter is a licence version of the Russian Mil-1. Below, controls and instrumentation.

Czech *Super Aero 45* four-seat touring aircraft.

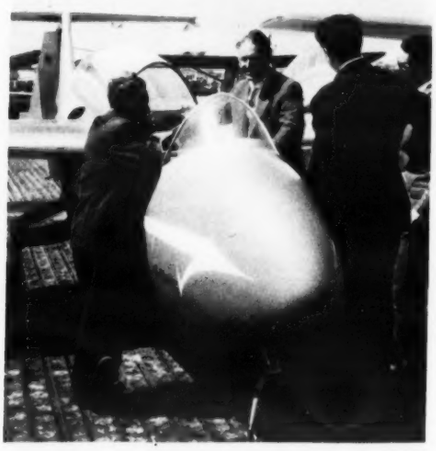
Hanno Fischer (centre) by his RW.3 *Multiplan*.

There is no doubt the opportunity is fully appreciated. Visitors swarm over the static show like ants. This year the densest flow is around the *Snark*, with its scarlet nose pointing towards the sky and its stubby wings stretched back like a swimmer about to dive; "intercontinental guided missile, 5,000 miles range"—and the initiated picture to themselves the nuclear warhead which the slender nose could contain in certain eventualities.

Sheltering under one of the *Snark's* wings is the two-seat *Super Sabre* fighter which has crossed the Atlantic in less than 7 hours, to commemorate the 30th anniversary of Lindbergh's historic flight: 33 hours versus 7—these two figures graphically illustrate the progress made during these years. The B-47 bomber shows off its graceful lines; the gaping mouths of its six jets are at just the right height for the curious to peer into the nacelles, where compressors and turbines hint at the power which hurls the great mass along at more than 600 m.p.h.

The doors of the *Globemaster*, the U.S. Air Force's biggest aircraft, are open, to admit a constant stream of visitors anxious to inspect the enormous, double-deck fuselage, capable of carrying 200 fully-equipped soldiers.

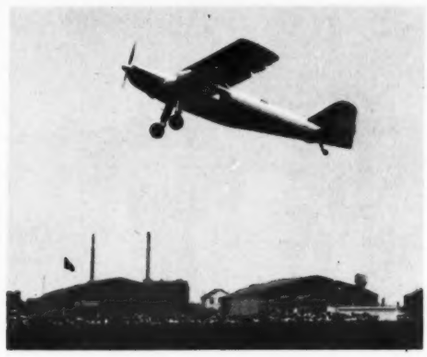
Other heavy military transports also attract the crowd, particularly those whose open doors invite inspection; one of them is the Lockheed C-130, entered direct by a ramp which is then raised to form the lower wall of the rear fuselage; the Fairchild C-123, more modest in size but just as easily accessible, the Breguet *Deux-Ponts* reached via a somewhat rickety ladder, the Nord 2501 with its stocky fuselage.



Lockheed C-130A *Hercules* turboprop assault transport, U.S.A.F., with large black radar nose.

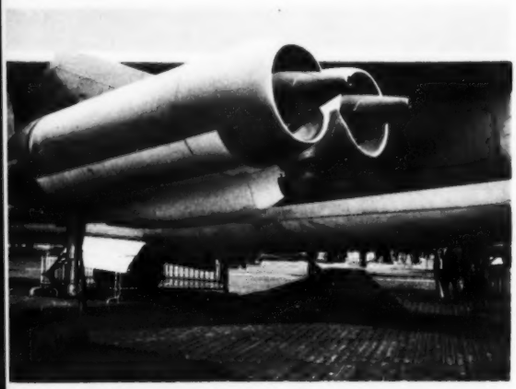
PARIS

Guest from the East: Tupolev Tu-104 jet commercial transport.



Dornier Do 27, a highly-esteemed contribution from the Federal German Republic.

One of the Tu-104 engine nacelles . . . carefully covered over (and sealed each night).



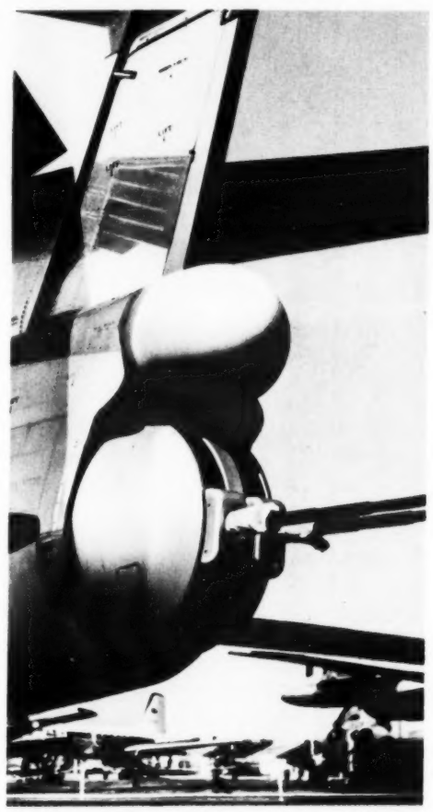
Double nacelle (for two General Electric J 47s) in the Boeing B-47 *Stratojet*.

(On Friday, between the American C-130 open to the public without restrictions and the Nord 2501, had been the Russian Tupolev Tu-104 twin-jet transport. It was surrounded by a fence and strictly guarded by police; it was accessible only to the fortunate holders of a special pass issued by nobody knew whom. From the outside the aircraft is handsome; too bad it was not possible to examine its interior fittings.)

Meanwhile, out on the airfield, the two big Vertol helicopters detailed for the shuttle service between Le Bourget and Issy-les-Moulineaux take off amid the roar of their tandem rotors, and move away nosedown. The British *Twin Pioneer* also gives a demonstration of the efficiency of the multiple flaps along its wings by taking off in a few yards and immediately climbing at an impressive angle.

These are the workhorses of the Salon; they are there to provide transport facilities, though are not averse to showing off their qualities in the process.

By now the flying display is about to begin. The crowd starts to move toward the runway edge, while the small aircraft take successively to the air to be put through their paces. They are Polish (TS-8 *Bies*), or Italian *(Falco)*, or German (Dornier Do 27), or Czech (Zlin 26), or French (Jodel, *Broussard*, Potez 75). They are followed by two machines whose unusual silhouette is conferred on them by an extremely narrow wing. This wing abviously also gives them unusual qualities, since they take off in a very short



The Douglas B-66's remote-controlled tail gun post with two 20-mm cannon and a radar distance measuring equipment.

U.S.A.F Sikorsky S-55 helicopter landing. Behind, one of the Vertol H-44s used for the shuttle service between Le Bourget and Issy-les-Moulinaux.

Fairey's Ultra Light Helicopter on its road transporter.

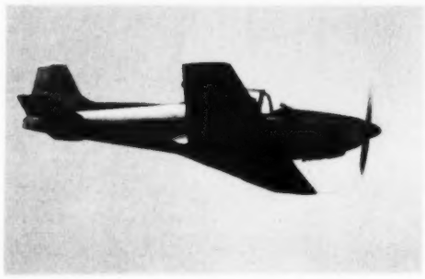
The Hurel-Dubois-Miles HDM.105 narrow-wing cargo aircraft, a joint Franco-British design, shines in slow flight.

distance and can fly at very low speeds and in the most unlikely attitudes; they are the French Hurel-Dubois HD.34 and the HDM.105, a small aircraft of mixed design, British for the fuselage and French for the high-aspect-ratio wing.

Next comes a clean-lined twin-engine short-stage transport, the Dutch Fokker F.27 *Friendship*, which will certainly appeal to many a potential air traveller among the spectators; because of its high wing layout passengers must be able to see the ground from the cabin windows as from a balcony. The exhibition of manoeuvrability it now gives is such as few travellers on regular airline services would altogether appreciate. It is followed by two Czech aircraft, the 210 h.p. *Super Aero* twin-engine touring aircraft, and the Avia 14 twin-engine transport, both of which give a very good account of their respective capabilities.

But all this is no more than a curtain-raiser, while the display proper now begins with a fly-past by some twenty helicopters in close formation, which skim at low altitude across the runway in a composite din made up of the whistling of turbines and compressed-air nozzles, the roaring of piston engines and the sweep of rotors beating the air. Here we see *Djinns, Alouettes,* Sikorsky S-58s, Vertols, etc.

The various "numbers" on the programme then follow one another without pause, the spectator's attention being constantly caught either by the aircraft manoeuvring in the sky or



Italy's Aviamilano F.8L *Falco* sports aircraft.

Polish TS.8 *Bies* trainer.

Czech Zlin *Trener* sports aircraft.

"Workhorse of the Salon", the Scottish Aviation *Twin Pioneer* short-take-off aircraft busily shuttled from Le Bouget to Issy and also took part in the flying display.

France's Max Holste MH.1521 *Broussard* multi-purpose aircraft.

Nord 3202 trainer.

The Potez 75 armoured police aircraft takes off from the grass surface.

Spanish-German jet trainer, Hispano Aviación HA.200 *Saeta*, a design by Prof. W. Messerschmitt.

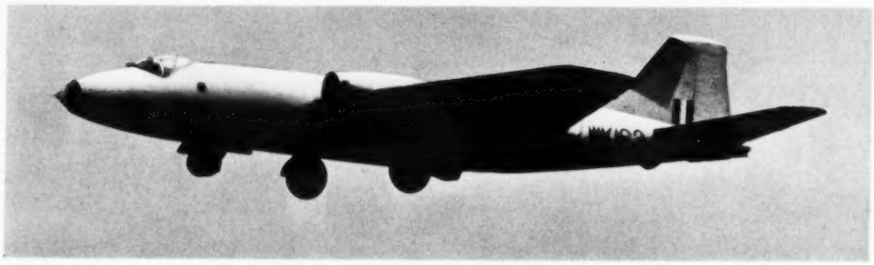
Hurel-Dubois HD.34 survey aircraft belonging to the *Institut Géographique National.*

In Holland's colours: the Fokker F.27 *Friendship* turboprop commercial transport.

The *Friendship* flying on one engine . . .

PARIS

. . . like the Czech Avia 14.



English Electric *Canberra* going round again on its Napier *Scorpion* auxiliary rocket (beneath the fuselage).

Handley Page *Herald* short and medium-stage airliner.

Bristol *Britannia 301* turboprop airliner taking off.

The helicopter circus: *Djinn*, *Alouette*, Sikorsky S-58, Vertol H-44.

by those taking off for a later, precisely timed appearance in front of the main stand.

First comes the Handley Page *Herald* four-engine transport for 44 passengers, followed by a "surprise", a twin-jet *Canberra* equipped to serve as a flying test bed for a Napier *Scorpion* rocket motor. The commentator remarks that this is the version's first demonstration on the Continent. As he passes the grandstand the pilot starts his rocket; a long tongue of fire shoots out from beneath the fuselage, and the aircraft climbs vertically towards the clouds with an enraged bellow.

Now comes the turn of the Nord 2506, the civil transport used by U.A.T., with two jets in the wing tips to enable it to take off with ease in hot weather or at high-altitude airports.

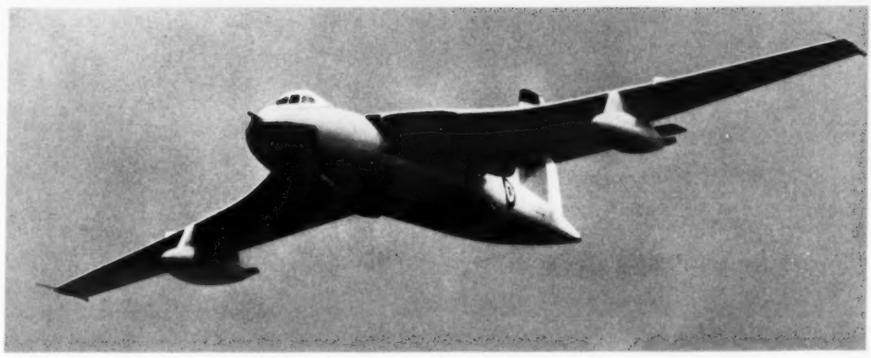
The *Valiant*, an enormous machine painted white, makes impressive runs at both high and low speeds (a few days earlier one of its companions had dropped a hydrogen bomb over the Pacific islands).

The commentator next draws the public's attention to a Nord 2501 which is flying over the field at 6,500 ft.; three black dots are seen to detach themselves from it and to fall downwards, leaving behind them a trail of smoke; they are three parachutists in free fall, and the layman is astonished to see that they do not fall straight down like stones, but can direct their path within limits; just at the moment when the three men can be seen with their arms spread, the parachutes unfold, and they land with remarkable precision in the middle of the field.

The Hawker *Hunter 7* two-seat fighter trainer has meanwhile taken off with a mighty roar, followed by a breath-taking acceleration; nonetheless, it swallows a large portion of the runway before becoming airborne. Its demonstration combines manoeuvrability with speed. Just as, on its last run, it is flying at low altitude along the runway it is accompanied by a double bang. . . not produced at 60 ft. as many spectators think, but a good many thousand feet higher. The bang and the aircraft have reached the runway almost simultaneously.

(On Saturday at this point, to the lively amusement of the crowd, a hare had made a "convincing" demonstration of manoeuvrability among the aircraft on the ground; in order to reduce his drag he had folded back his long ears, raising

Hawker *Hunter T.7* two-seat trainer and ground attack aircraft.



R.A.F. Bomber Command's visiting card: the dazzling white Vickers *Valiant B.1*.

them again to brake before stopping abruptly; his ears then became radar reflectors which turned in all directions to determine which way the noise was coming; but it was coming from all directions; probably he finished his career in somebody's casserole, for lack of adaptability to his surroundings.)

The *Hunter 7* is followed by three Breguet 1050 *Alizé* anti-submarine aircraft, of the category which still needs a propeller in order to fly, and then by a Fouga CM. 175, the jet trainer designed to land aboard an aircraft carrier.

The seven *Hunters* forming the R.A.F.'s aerobatic team have meanwhile taken off in formation. Five of them prepare for the actual display, while the other two disappear into the blue, as standbys. The succeeding figures are carried out in high style in impressively close formation, attractively varied by changes in formation during the course of some of the manoeuvres.

After the flight by a small Spanish jet aircraft, the *Saeta* (Hispano Aviación), a patrol of three Fouga *Magisters* gives striking proof of the skill of the Salon Flying Training School's instructors. The Morane Saulnier MS. 760 *Paris* jet communications aircraft follows. The Shah of Persia, who has ordered one, is present to watch it and is no doubt feeling highly pleased at the prospect of himself owning so speedy and manoeuvrable a machine.

Then comes the *Caravelle*'s turn. Two years ago it had made a brief appearance in flight; this year its demonstration, from take-off to landing, is much longer, and it shows off its exceptionally beautiful lines, at both high and low speed, to a public which naturally swells with national pride at the spectacle (a model of the *Caravelle*'s fuselage is on view in the Static Show, and Parisians, determined not to leave the exhibition grounds without inspecting it fully, form around it the longest and most patient queue seen for many a year).

After the *Caravelle*'s display there are many spectators who stream back to the Static Show and the exhibition building to escape from the glaring sun.

Meanwhile, the Show continues.

The *Gerfaut* 1405 (SNCAN) takes off and only a few seconds later announces that it has reached the altitude of Mont Blanc and then of Everest. Meanwhile, the small *Skeeter* helicopter is manoeuvring gracefully above the runway. It is followed by the *Durandal* interceptor (Sud-Aviation), which looks more like a missile with a rudimentary wing; in order to stay in the air it has to go fast.

Suddenly, a cloud of yellow dust, slowly carried away by the wind, rises at the end of the field, in front of the hangars. The loudspeakers announce the *ATAR Volant*. The crowd rushes off to catch a glimpse of the strange object—a sort of vertical pipe which slowly moves towards the stand, stops, turns several times about itself, rapidly climbs and returns placidly (though noisily) to its point of departure; it descends resting on its jet exhaust, which once again raises clouds of dust. Something really new has been shown at the 22nd Paris Salon.

By this time the public is beginning to show signs of flagging interest; small knots of people form in the shadow of the aircraft wings, and many have stretched out on the grass to rest.

The demonstrations continue. The Vickers N.113 *Scimitar* heavy carrier-based fighter shows

The Fouga CM.175M *Marine* two-seat carrier-based trainer makes a simulated deck landing . . .

. . . followed by the Breguet 1050 *Alizé* anti-submarine aircraft.

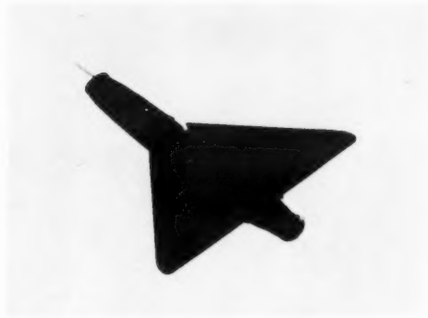
Sud-Aviation's two turbine helicopters: *Gouverneur* (enclosed, below) and *Alouette*.

Westland *Widgeon*.

Bristol 171 *Sycamore*.

French spectators greeted their elegant Sud-Aviation *Caravelle* jet transport with understandable pride.

PARIS



SE.212 *Durandal* interceptor.

Italy's Aerfer *Sagittario 2* light-weight fighter turning in to land.

that nothing supersonic, including the bang, is unknown to it; it is followed by the Breguet 1100 light single-seat tactical support aircraft, the Dassault *Etendard IV* with its particularly clean lines and polished aluminium skin glinting in the sun, and the *Sagittario* 2 small fighter, of equally pleasing shape, from Italy.

Then comes the Italian Air Force team on F-86 fighters, with a demonstration combining power, grace and... the flourish of a final bouquet formed of smoke trails. An impressive moment is when the four aircraft, approaching from the four points of the compass, dive almost to ground level and cross above the stand.

Britain's *Gnat* (Folland) light fighter comes next, followed by the *Baroudeur* (Sud-Aviation) which takes off without wheels, from skids, raising a huge cloud of yellow smoke.

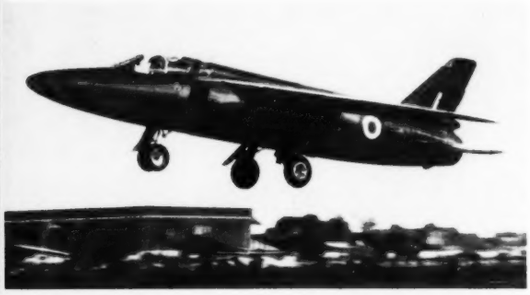
An interlude for the U.S. Air Force's tremendous piston-engine *Globemaster*.

Two patrols of three *Vautours*, coming from Brétigny, appear over Le Bourget and trace precision arabesques in the sky, amid the howl of their twelve jets; a bang underlines the demonstration.

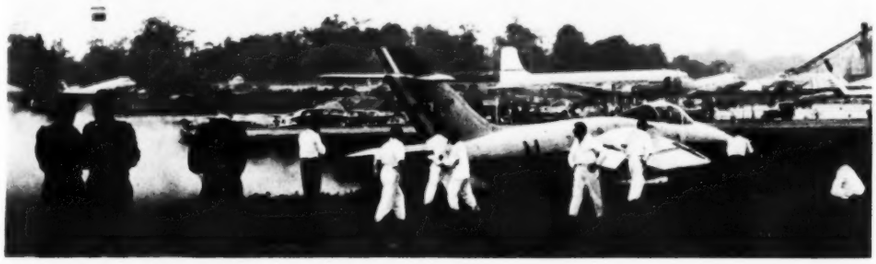
After the take-off of a U.A.T. Douglas DC-6 for a far-away destination, France's acrobatic patrol of four *Mystère IVAs*, wing-tip to blue-white-red wing-tip, show off the series of figures and evolutions which jet fighters can perform despite their impressive speed. The final flourish is accompanied by a supersonic bang occurring at the exact moment when the four aircraft, climbing vertically, break formation and speed in four directions on wide-flung trajectories curving down towards the ground.

The public begins to move towards the exits.

As spectators line up in good order to pile aboard the buses for the Porte de la Chapelle, three Dassault *Super Mystère* fighters cleave



Britain's Folland *Gnat* light-weight fighter just before touchdown.



Skiii . . . the *Baroudeur* (Sud-Aviation) takes off *from its skids*.

Vickers N.113 *Scimitar* twin-jet carrier-based single-seat fighter about to land (with nose wheel still turned slightly sideways).

Dreamlike demonstration of the manned *Atar Volant* (SNECMA): after rising vertically from a concrete area (left-hand picture), the "flying stovepipe" bows slightly, flies over the parked *Baroudeur* and moves over to the main stand. A sudden, carefully calculated about turn, and the machine returns to its point of departure . . . and gently sinks to the ground.

Czech aerobatics champion (second place in the 1956 world championships at Coventry) taxies his Zlin *Trener* for a hundred yards "on one leg".

Intentional and Unintentional Stunts

During the aerobatics display on Saturday (June 1st) the engine of the Skyblazers' right-hand wing-man failed . . . whereupon the pilot, escorted by his comrades, made for the runway in a glide – with the wind behind him – opened his brake parachute (top) and then touched down so skilfully that he was able to turn into a taxiway and clear the runway (bottom). – Lowest picture, the airport fire service (and ambulance) on the alert.

One of Sunday's three parachutists made a masterly landing on the runway after a long fall . . . right in front of the control tower.

Russia's Tupolev Tu-104 jet commercial transport lands. Aircraft of this type have been in service for several months on the Prague – Moscow – Peking route.

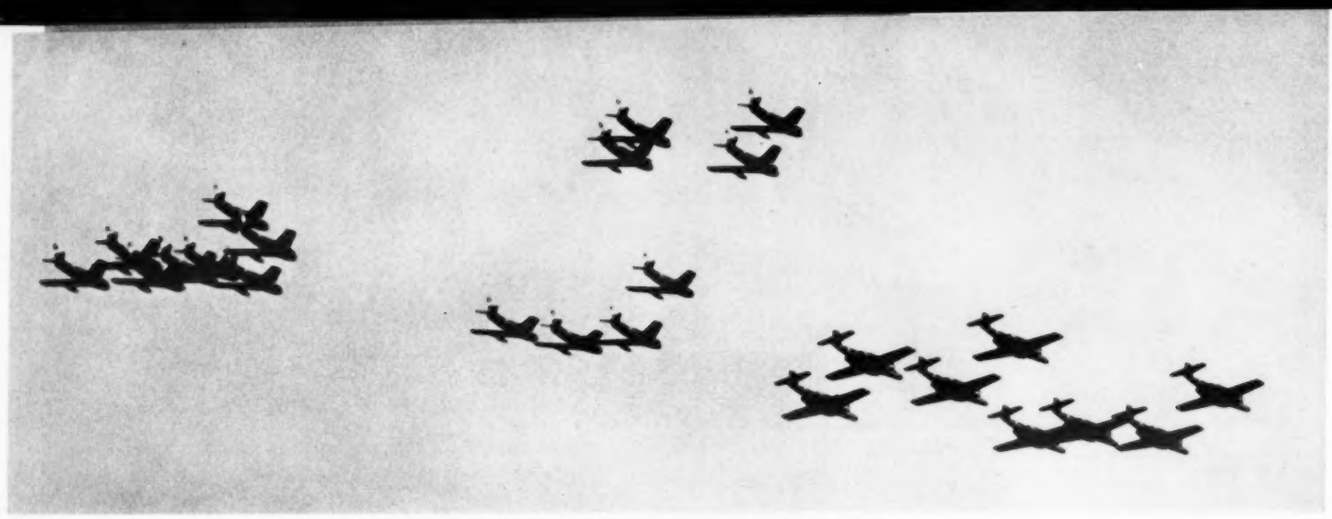
A unique sight at Le Bourget – though it takes place on an average every three minutes in the U.S.A.F.'s Strategic Air Command: in-flight refuelling of a Boeing B-47 by a Boeing KC-97G tanker aircraft.

Dassault *Etendard IV* supersonic ground attack aircraft.

The Breguet 1100 twin-jet ground attack aircraft makes its first appearance in public . . .

. . . as does also the Sud-Aviation SE.212 *Durandal* single-jet supersonic interceptor.

Nord 1405 *Gerfaut* interceptor prototype before taking off on a breath-taking climbing demonstration: to the height of Mont Blanc in approx. 50 seconds.



N.A.T.O. contingent : Canadian Avro CF-100 all-weather fighters (right foreground) and Canadair F-86 *Sabre* interceptors.

The U.S. Air Force's Skyblazer team on North American F-100 *Super Sabres.*

A bouquet of smoke trails closes the Italians' impressive aerobatic display on North American F-86 *Sabres.*

The R.A.F. team accomplishing one of its frequent changes in formation in close array (Hawker *Hunters*).

Fast run by the "Patrouille de France" on Dassault *Mystère IVAs.*

Accurate formation landing by the Italian patrol (F-86 *Sabres*).

through the air like bullets, to complete their display with yet another bang. They are followed by the Russian Tupolev Tu-104 twin-jet transport, with its negative dihedral wing; though it has difficulty in concealing its military ancestry, it is just the same a handsome machine.

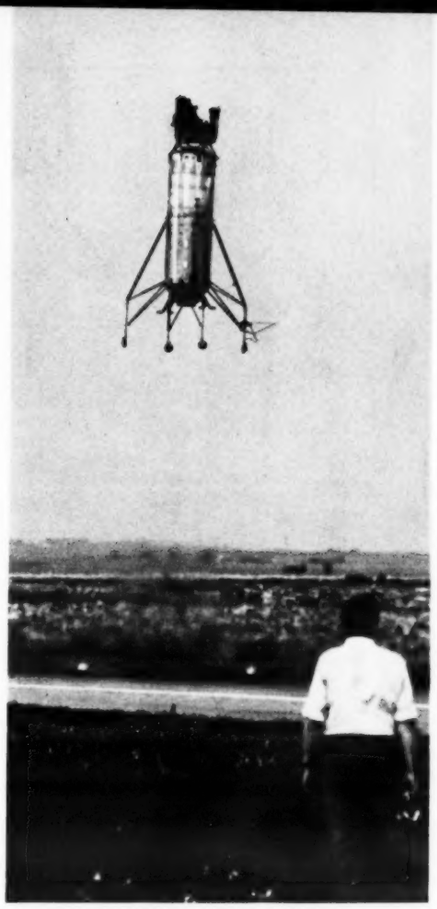
The buses roll along towards Paris, and we begin to realize how many people have watched the display from outside the field. They had installed themselves along the roads and in the fields, crowding together on the smallest piece of higher ground. Four aircraft race hedge-hopping towards Le Bourget, the U.S.A.F. Sky Blazers' *Super Sabres.*

At Le Bourget, the display is drawing to a close; the programme still includes a helicopter demonstration (Bell 47-Js, Hiller H-23Bs and Polish SM-1) followed by two fly-pasts, one of 50 French Air Force *Mystère IVAs,* and the other of 60 American fighters from N.A.T.O.

At the Porte de la Chapelle the café terraces are immediately taken by storm and there is a run on lemonade. The Paris public is well satisfied; the French Aircraft Manufacturers Association has put on a wonderful show. Two years ago many had been a bit disappointed by the absence of supersonic bangs—the weather had been uncooperative; this year they have had full measure—and have seen the *Flying ATAR* into the bargain.

France's Contributions Range from Supersonic to Bush Aircraft

By "Miles"



Surrealist aircraft engineering, 1957: SNECMA's piloted, free-flying *Atar Volant* recalls the 1927 painting "Monument aux Oiseaux" by Rhineland artist Max Ernst (Pierre Matisse Gallery, New York).

Military experts who had the privilege of inspecting the Static Show at Le Bourget and watching the flying displays came away in many ways disappointed. Among French designs they had seen neither the *Trident II*, nor the Leduc 022, nor even the *Mirage III*, which remained in sight for only a few seconds, at a respectable altitude and flying at some 700 to 800 m.p.h. The guest industries, too, had been equally reticent. Neither the English Electric P.1, nor the Lockheed F-104 nor the Chance Vought *Crusader* were at Le Bourget. As for missiles, it had been obvious from the start that even fewer current designs would be shown in this field.

It must also be admitted that the experts assembled in Paris did not experience the moments of excitement and curiosity which have preceded many a Farnborough Display, when British manufacturers have rushed their newest machine through the regulation 10 hours of flight required before any presentation in public. A typical example that comes to mind is the astonishing first appearance of the Avro *Vulcan*, when its pilot, Roland Falk, humorously remarked that it was as new to him as to the public.

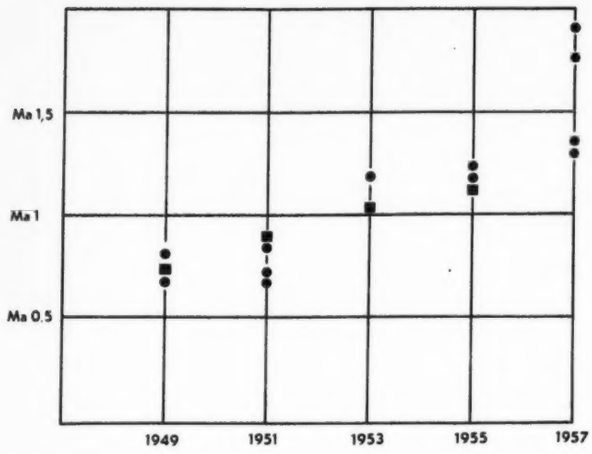
There was, however, one exception at Paris: the ATAR C.400 P.2. Not that SNECMA was taking any uncalculated risks, since the *Flying Atar* had already made a number of flights during the months preceding the 1957 Salon, but it was certainly an exception from the very spectacular nature of the demonstration it gave. Not only the engineer was impressed, but also the general spectator. Since time immemorial, wings, whether fixed or rotating, of feathers or of metal, had always been the *sine qua non* of flying. The sight of this heavy cylinder rising and descending with the invisible support of its jet exhaust, was something quite out of the ordinary. It recalled the "Monument to the Birds" painted by Max Ernst in 1927 and raised visions of a kind of surrealism in aircraft engineering.

SNECMA's technical bulletin announced that the company is working on "an aircraft equipped with the *Flying Atar* and designed to the annular wing formula" (Zborowski patents). There are those who may ask themselves where this family of coleopters will lead. It has been said that when the *Flying Atar* has been equipped with an annular wing, fuel tanks, a cockpit for the pilot, and armament, the result will be roughly similar to that reached by Lockheed, Convair and, more recently, Ryan. When the jet engine is sufficiently "dressed up" to fit it for manned operational use, some of the technical devices with which SNECMA engineers have succeeded in flying a wingless metal cylinder will become more or less superfluous.—As far as future plans are concerned, it is known that SNECMA proposes to build a subsonic P.3 version, to be followed by an experimental supersonic vehicle with mixed (jet plus ramjet) propulsion. The latter is expected to exceed Mach 2, thus coming up against the first troublesome or dangerous manifestations of friction heating.

An examination of these projects reveals that SNECMA is obliged to complete the whole conventional cycle, beginning with an experimental subsonic vehicle and proceeding through all the intermediate stages before arriving at a supersonic coleopter of operational value. The result will be the astonishing marriage of supersonic flight and vertical take-off. But as the configuration is radically different from those which today produce speeds of Mach 1.5 or Mach 2 but do not permit of vertical take-off and landing, the whole long development road must be followed anew, without short cuts. Since "point" take-off is considered necessary, and assuming that there are no other means of achieving it, time is no object.

Meanwhile, the "background" to the project merits closer attention. It is already generally believed that, within a few years from now, the pure piloted interceptor will be of only limited utility. The greater the increases in range and accuracy of the surface-to-surface missile—and such increases are only a matter of time—the less the piloted aircraft will meet the needs of air defence. (Unless it is needed to launch anti-missile missiles—presuming it could do so—and unless it has sufficient endurance to mount a more or less permanent anti-missile guard.) As for the surface-to-air missile, for which a coleopter configuration has also been proposed, it is by no means certain that the system of mixed propulsion combining a jet engine and a ramjet is the most suitable. Today, rocket clusters, with an acceptable initial weight, give ranges of 80 to 100 nautical miles, speeds of Mach 3 to 4 and ceilings of 98,000 to 115,000 ft. Armed with a nuclear warhead, these missiles will doubtless not be recoverable, at any rate when they have accomplished their mission. It would therefore be useless to provide them with recovery equipment, except perhaps for an unused warhead.

There remain ground attack and long-range offensive missions. The former, even more than the latter, are better executed by piloted aircraft with vertical take-off and landing (for example, against mobile enemy units). The short radius of turn which an aircraft of the coleopter configuration could achieve will also be greatly in demand. However, the speeds which can be obtained by means of ramjet propulsion and which form one of the project's chief attractions are not ideally suited to the low altitude at which ground attack missions must be carried out. Yet the project has other advantages. The present line of development will doubtless culminate in the only flying machine which, while simple in design and structure, will be capable of the full speed range from zero to several times the speed of sound. Its strictly military value can, of course, be assessed only if each of its advantages and its limitations is properly evaluated, and at the same time the probable date by which a military coleopter could become fully operational is borne in mind. Faced with the threat of widespread initial destruction in the event of nuclear war, air forces should remember that their best hope of survival



Performance of some of the French high-speed aircraft demonstrated at the last five Paris Air Shows 1949–1957). A square indicates a production model, a circle an experimental aircraft or a prototype.

lies in a combination of mobility, dispersal and underground shelters. Obviously, it is the vertical take-off machine that best provides all three safeguards for tomorrow's air forces, regardless of what aircraft or missiles they use.

*

Light aircraft at the Salon

Light combat aircraft were well represented at Le Bourget. Though the Fiat G.91 was regrettably absent, the Aerfer *Sagittario 2* and above all the Folland *Gnat*—one of the first light-weight aircraft built, but now eliminated from the N.A.T.O. contest—aroused interest through the quality of their demonstrations. It should be added here that the *Gnat* was designed as an interceptor, whereas N.A.T.O.'s inter-Allied experts were looking for a machine specializing in ground attack duties. What was required was an aircraft which was capable of carrying heavy armament, with relatively low vulnerability in flight thanks to good low-altitude speed, and which could escape destruction on the ground by dispersal and frequent changes of base. This latter requirement settled the aircraft's characteristics: it had to be relatively light in weight, have a good thrust/weight ratio and be fitted with low-pressure tyres or skids enabling it to use rudimentary runways such as could be constructed in large numbers. The Folland *Gnat*, designed for interception at altitude and not for ground attack, and fitted with high-pressure tyres, did not meet the specifications for a light ground attack aircraft as laid down by S.H.A.P.E. on the basis of the requirements of continental strategy. Moreover, as the years pass, the development of nuclear weapons and the introduction of increasing numbers of surface-to-surface missiles into the Great Powers' arsenals will tend to increase the validity of this programme and to shift the emphasis even more firmly on to the need to ensure survival on the ground rather than invulnerability in flight. With each succeeding day the experts clamour more loudly for the capability to use shorter and shorter and simpler and simpler runways, and are becoming less vocal on the subject of speed. It is, in fact, realized that the best of supersonic combat aircraft, if used at roof-top altitudes, will not do better than a high subsonic speed. And it is reported that the U.S.S.R. has begun production of a ground attack aircraft with a low-altitude speed in the region of Mach 0.8 to 0.85.

PARIS

One of the present SE.5000 *Baroudeur's* attractions is that it has abandoned the wheeled trolley which it originally used for take-off and can now manage quite happily on the kind of grass field that was available at the beginning of the last war. Superbly demonstrated by Test Pilot Maulandi, who is well acquainted with all its qualities, the aircraft made some very impressive tight turns, of the kind needed in air/ground combat. However, the design's very age is against it. When it first came out it was too unconventional to be universally accepted, and its virtues were not recognized early enough to prevent later costly projects from being undertaken.

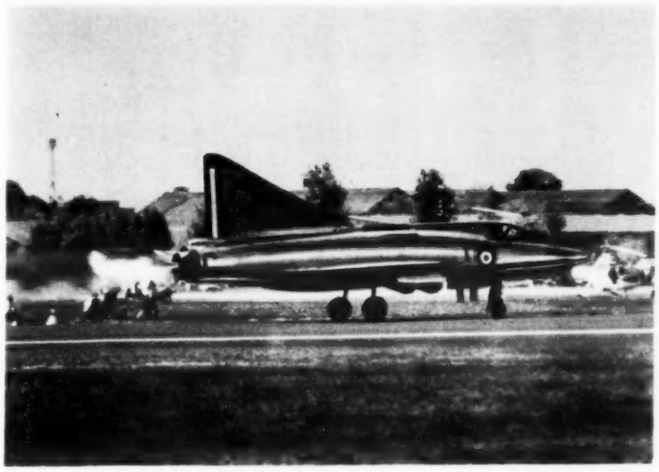
The Breguet 1100 and the Dassault *Etendard IV* belong to the same family, but on different levels. The former was designed to meet the curious French programme for an aircraft using small jets (2,000 to 2,600 lbs. thrust) mounted in pairs, and capable of performing both interception and ground attack missions. Actually, it is difficult to see what interception tasks a merely transonic aircraft will be able to perform in 1960 and later. In the Breguet 1001 *Taon*, on the other hand, the specifications prepared for the N.A.T.O. programme have been followed, and the aircraft's performance has been planned to meet the needs and the limitations of air/ground combat. The *Taon* was not at the Salon (nor was the *Etendard IV*, which suggests that N.A.T.O. prefers to keep its designs out of the public eye, at any rate for the moment), but it will be one of the most serious competitors in the inter-Allied contest due to be held shortly; the winners will receive N.A.T.O.'s stamp of approval.

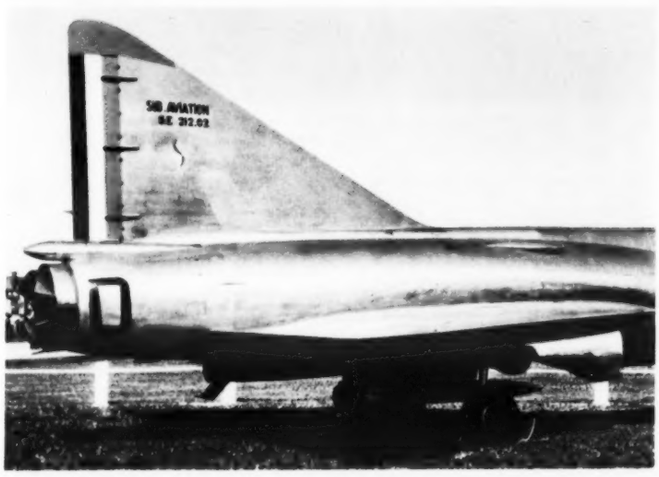
The *Etendard IV* is also designed to meet the inter-Allied programme. At present fitted with an *Atar E* delivering 7,700 lbs. of static thrust, it already has a thrust/weight ratio at least equal to the N.A.T.O. programme's production aircraft, since the experts have chosen the Bristol *Orpheus 12* of approximately 6,800 lbs. thrust (without reheat) as standard jet engine.

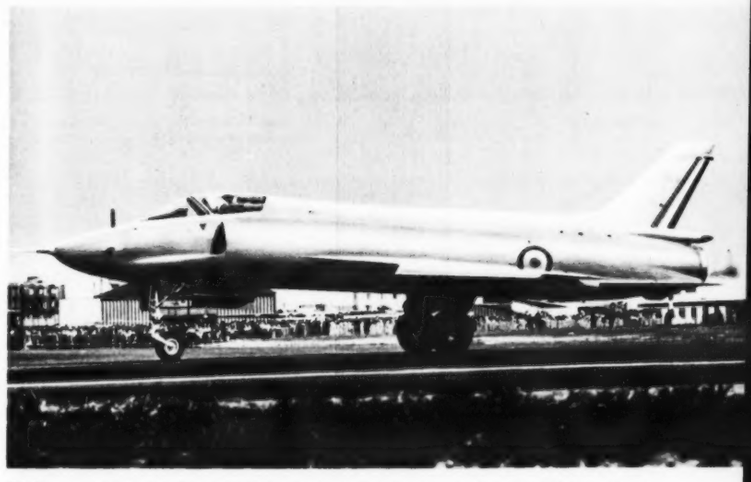
Sagittario 2, Gnat, Breguet 1100, *Etendard IV* and *Baroudeur* all are the results, in different forms and for varying missions, of an effort to reduce structural weight. It may well be that the weight curve will shortly begin to rise again. But the light-weight formula will at least have had

The Sud-Aviation SE.5000 *Baroudeur* ground attack aircraft has abandoned the take-off trolley it originally used. It now takes off . . .

. . . and lands, with the aid of its skid, on any sufficiently long, flat grass surface.







Example of a weapons system is the SE.212 *Durandal* interceptor (Sud-Aviation): top, the first prototype taking off; bottom, the second prototype with Matra 510 rocket. Note the eyelids for the afterburner in the rear and the rocket motor under the fuselage.

Within certain limits the Dassault *Etendard IV* (top) and Breguet 1100 (bottom) belong to the same family, that of the light-weight combat aircraft.

the merit of having slowed down the progress towards higher and higher weights by forcing airframe designers and accessories manufacturers to seek means of miniaturizing their equipment and reducing its weight.

France's design offices have reverted to the light aircraft, with either piston or turbine engines, and redesigned aircraft categories which were familiar many years ago. Obviously, events outside France and preoccupations other than those directly concerned with the defence of Western Europe have been the reason for this step backwards. One of the first aircraft demonstrated in the Flying Display at Le Bourget was the Potez 75 ground attack aircraft for use against a lightly armed enemy (it does not have the speed to escape heavy fire). Other similar designs were also shown at the Salon. SIPA, for example, exhibited a model of the S.1100 with two 600 h.p. engines (Pratt & Whitney R-1340), and Morane-Saulnier a model of the MS.1500 *Epervier* with 700 h.p. Turboméca *Bastan*. The latter aircraft is designed to use fields less than 1,600 ft. long, have a top speed of 170 knots and an endurance of 4 to 7 hours depending on whether it carries auxiliary fuel tanks. It would be armed with machine guns, bombs, air-to-surface missiles or rockets. Sud-Aviation is also said to be working on an aircraft of similar characteristics. This sudden blossoming of 1935-style aircraft may well appear surprising. If the category is needed —and if the old aircraft are either not suitable or are succumbing to old age—it would not at first sight seem to be so difficult to produce as to necessitate so big a field of contestants. Evidently the programme is not as simple as it appears.

Thus, not only did light-weight designs occupy a large place at the 22nd Paris Air Show, but also a new trend appeared for the first time, perhaps because of the very high performance obtained today with the aid of jet propulsion: this was the return to the conventional and to the piston engine. Has it not been said that the introduction of nuclear weapons on a wide scale has given fresh importance to guerilla warfare? Might not these light-weight, relatively slow aircraft be the ideal instruments for this form of warfare?

At the other end of the scale of French aircraft shown was the *Mirage III*. It was seen only for an instant, doubtless because, although it has been ordered by France's Secretariat of State for Air, it is still on the secret list.

Missiles and weapons systems

What was shown at Le Bourget in the way of missiles was not without interest. Engineers were able to see shapes and sizes—and appreciate problems with which they were acquainted solely from their reading. And the general public saw with its own eyes something of the new direction which development is now taking. Unfortunately very little was revealed about the guidance systems for these missiles, the real field of competition.

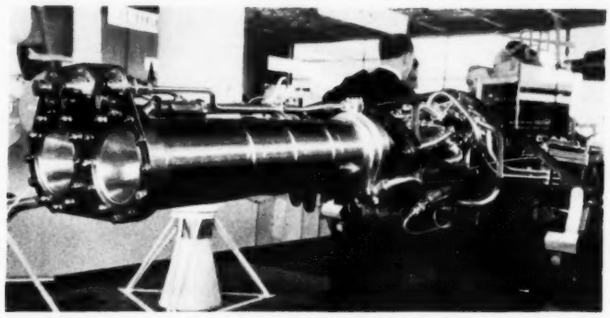
Another interesting feature of the Salon was the triumph of the weapons system concept. Though not always apparent at first sight, this concept was demonstrated in many of the exhibits. Stretching the idea a little, it might be said, for example, that the *Snark*, its launching ramp, boosters and *Globemaster* strategic transports constitute the *Snark's* operational weapons system. The *Vautour* was shown with its armament, and the *Durandal* with its Matra air-to-air missile. The *Mirage III* was designed from the start as a weapons system, consisting of the basic aircraft plus its air-to-air missile and its detection and fire control radar. Let us wager that at the next Paris Air Show the public can be initiated into the mysteries of interception by aircraft or missile through the demonstration of a simplified version of a detection and fire control system such as America's SAGE, for example. It will then better understand the roles of the various elements—aircraft, missiles, radar—which it has been accustomed to examining separately.

PARIS

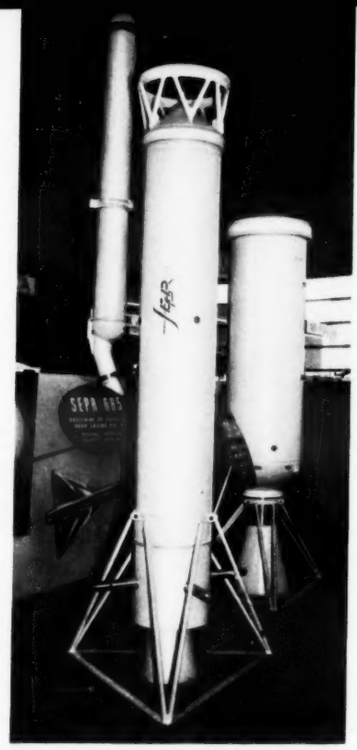
The Paris Engine Fair

As is now customary, this year's Paris Air Show again included an astonishing variety of engines of all kinds—ramjets and rocket motors, jet engines and propeller turbines, piston and compound engines. The following is a survey of the most striking exhibits from West and East.

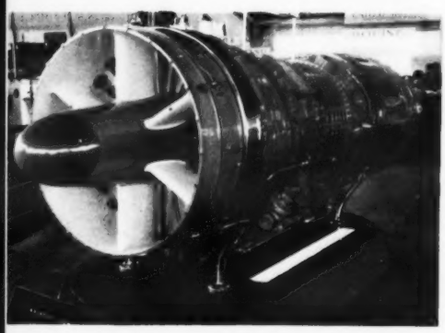
Britain: Bristol *Thor* ramjet. (Two *Thors* equip the Bristol *Bobbin* test vehicle.)



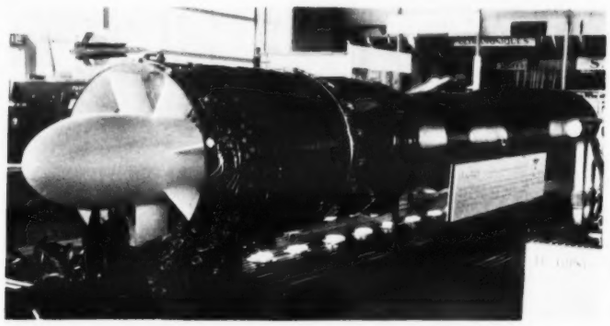
France: SEPR 661 liquid-propellant rocket motor for nitric acid and hydrogen peroxide, auxiliary powerplant for the *Mirage* and the *Trident*.



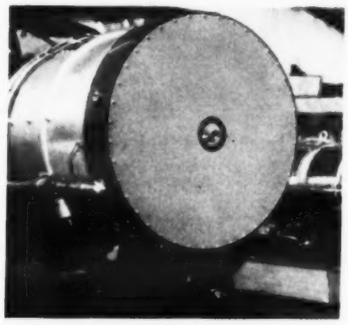
France: Sample collection of solid-propellant take-off rockets for large missiles (with thrusts up to 10 tons).



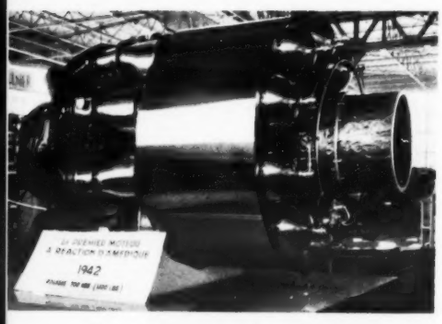
Britain: Bristol B.OI.6 *Olympus* twin-compressor turbojet of 16,000 lbs. static thrust.



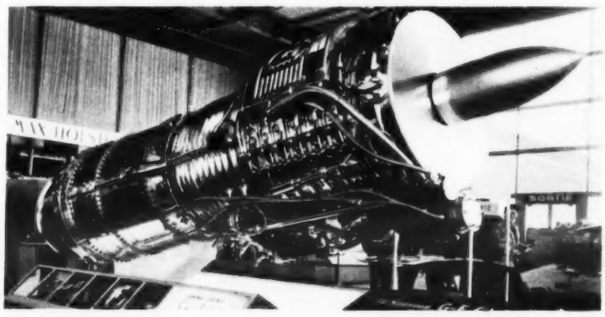
Britain: The de Havilland D.Gy. *Gyron* (25,000 lbs. thrust with reheat) for flying speeds of up to Mach 3 is considered to be the most powerful turbojet in the world.



U.S.A.: America's most powerful turbojet (with two compressors), the Pratt & Whitney JT4 (covered), civil version of the J75, for approx. 15,000 lbs. thrust (or more).



U.S.A.: A museum piece: General Electric's first jet engine, dating from 1942, for 1,540 lbs. thrust.



U.S.A.: General Electric's latest product is the CJ805 civil version of the J79 single-shaft turbojet of roughly 10,000 lbs. thrust (without reheat). It has a single, 17-stage all-steel compressor, whose inlet guide vanes and first six stator stages have variable blades (see detail picture of adjusting grid), also a three-stage turbine and only three main bearings.

People in Paris

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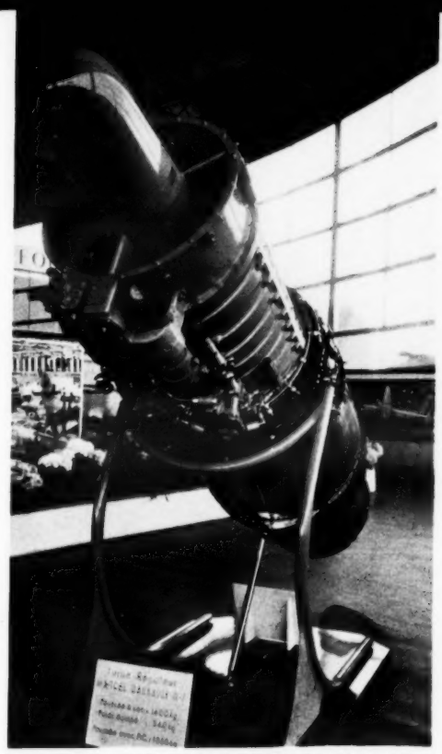
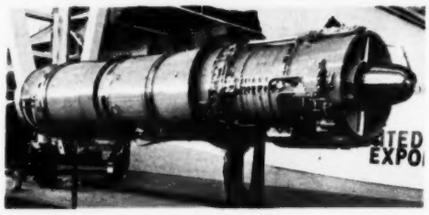
2

1 – Opening ceremony on May 24th, 1957: Defence Minister (now Prime Minister) Bourgès-Maunoury, Minister of Public Works Pinton, accompanied by General Bailly, Chief of the Air Staff, General Lauzin, Commander of the Second Air Region, and Georges Glasser, President of the Union Syndicale des Industries de l'Aéronautique, inspecting the French Air Force guard of honour. **2** – Studying the model of the *Caravelle*, left to right: Georges Glasser, President of USIA, Defence Minister Bourgès-Maunoury, Minister Pinton, Georges Héreil, President of Sud-Aviation.



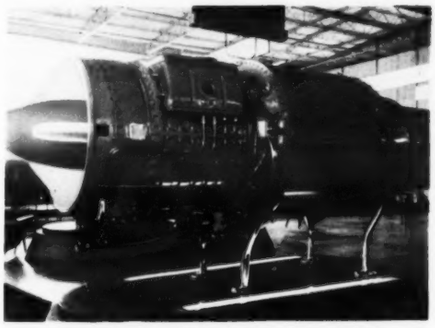
France : Dassault R.7 turbojet of 3,080 lbs. static thrust (or 4,070 lbs. with reheat); weight 770 lbs.

France : SNECMA's masterpieces: *Atar 9* jet (left) of 13,200 lbs. thrust with reheat, and *Atar E5* of 8,100 lbs. thrust (without reheat).

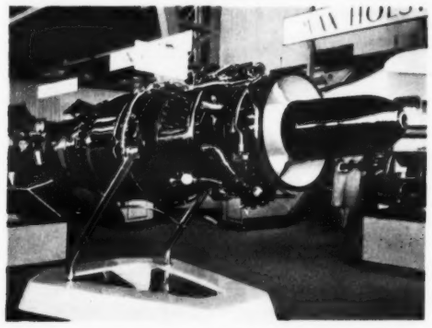


France : Hispano Suiza R.804 jet of 3,300 lbs. thrust (without reheat) and 680 lbs. weight.

France : SNCA du Nord afterburner on the Turboméca *Gabizo* jet; thrust 3,890 lbs. with reheat.

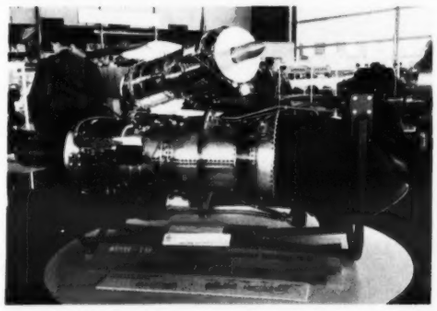


Britain : Bristol *Orpheus*, the engine chosen for N.A.T.O.'s ground attack aircraft; 4,850 lbs. (B.Or.3) to 6,810 lbs. (B.Or.12) thrust without reheat.

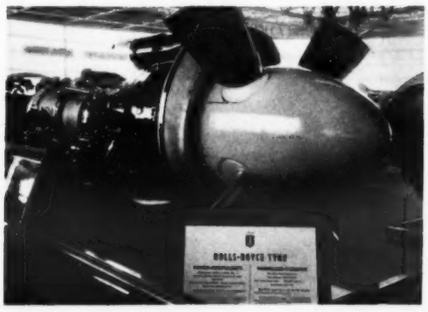


Britain : Armstrong Siddeley A.S.V.9 of 1,900 lbs. thrust (without reheat) for jet trainers.

Canada : Avro *Orenda 14* axial-compressor turbojet of 7,600 lbs. thrust.



U.S.A. : General Electric T58 shaft engine (e.g., for helicopters) of 1,024 s.h.p.; weight 325 lbs.



Britain : Rolls-Royce R.Ty. *Tyne* propeller turbine of 4,695 t.e.h.p.

Britain: Cut away model of the Bristol *Proteus 755* of 4,120 t.e.h.p.

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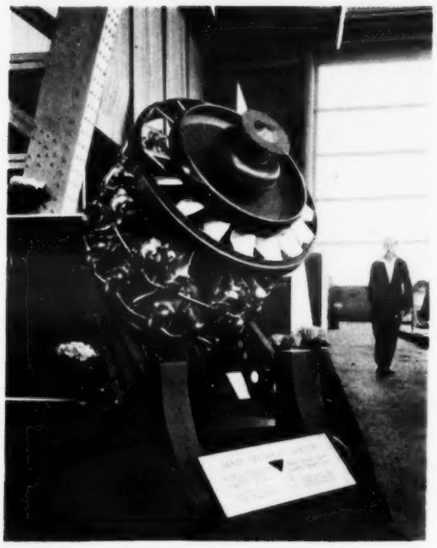
3 – Left to right: General Bailly, Chief of the Air Staff, F. Felix and R. E. Small (General Electric), G. Glasser, Defence Minister Bourgès-Maunoury. **4** – Professor Theodore von Kármán (Chairman of AGARD), J. S. Alford (General Electric) and Professor Maurice Roy (O.N.E.R.A.) face the camera. In the rear, Professor Hermann Blenk (DFL,Brunswick). **5** – H. Mansfield Horner, President of United Aircraft Corporation. **6** – The Right Honourable George Ward, Britain's Secretary of State for Air.

PARIS

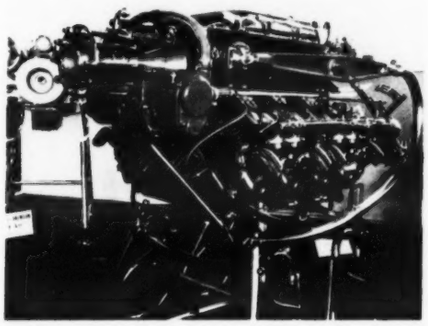


Britain : Alvis *Leonides Major* helicopter engine (with fan wheel), take-off rating 850 h.p.

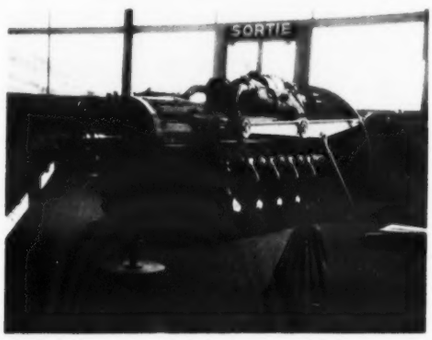
Poland : PZL WN-3 radial engine of 340 CV take-off rating, engine for the TS-8 *Bies*.

France : SNECMA *Hercules 759* two-row radial engine (Bristol licence) ; take-off rating now 2,040 h.p.

Italy : Meccanica Verghera Agusta produces two new small aero engines of 42 and 72 h.p., and a helicopter version for 72 h.p. (centre).

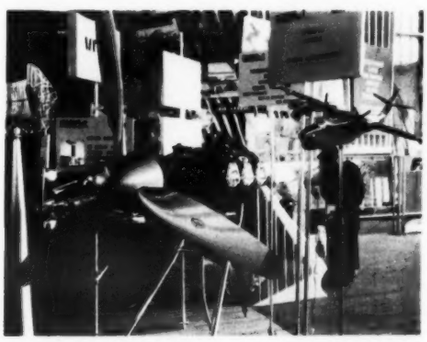


France : Salmson 8AS.04A eight-cylinder in-line engine of 260 CV take-off rating.

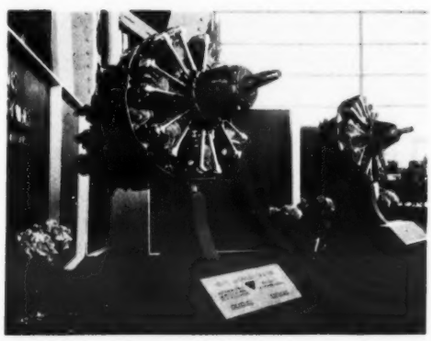


France : Potez 8D.30 eight-cylinder in-line engine of 520 CV take-off rating.

U.S.A. : Curtiss-Wright *Turbo Compound 18* of 3,400 h.p. take-off rating.



Italy : Licence version of the Lycoming GO-480B1A6 engine for 270 CV take-off power, with Piaggio P.1033-G4 v.p. propeller.



Britain : Alvis *Leonides Major* (front; 870 h.p. for take-off) and *Leonides* (540 h.p.).

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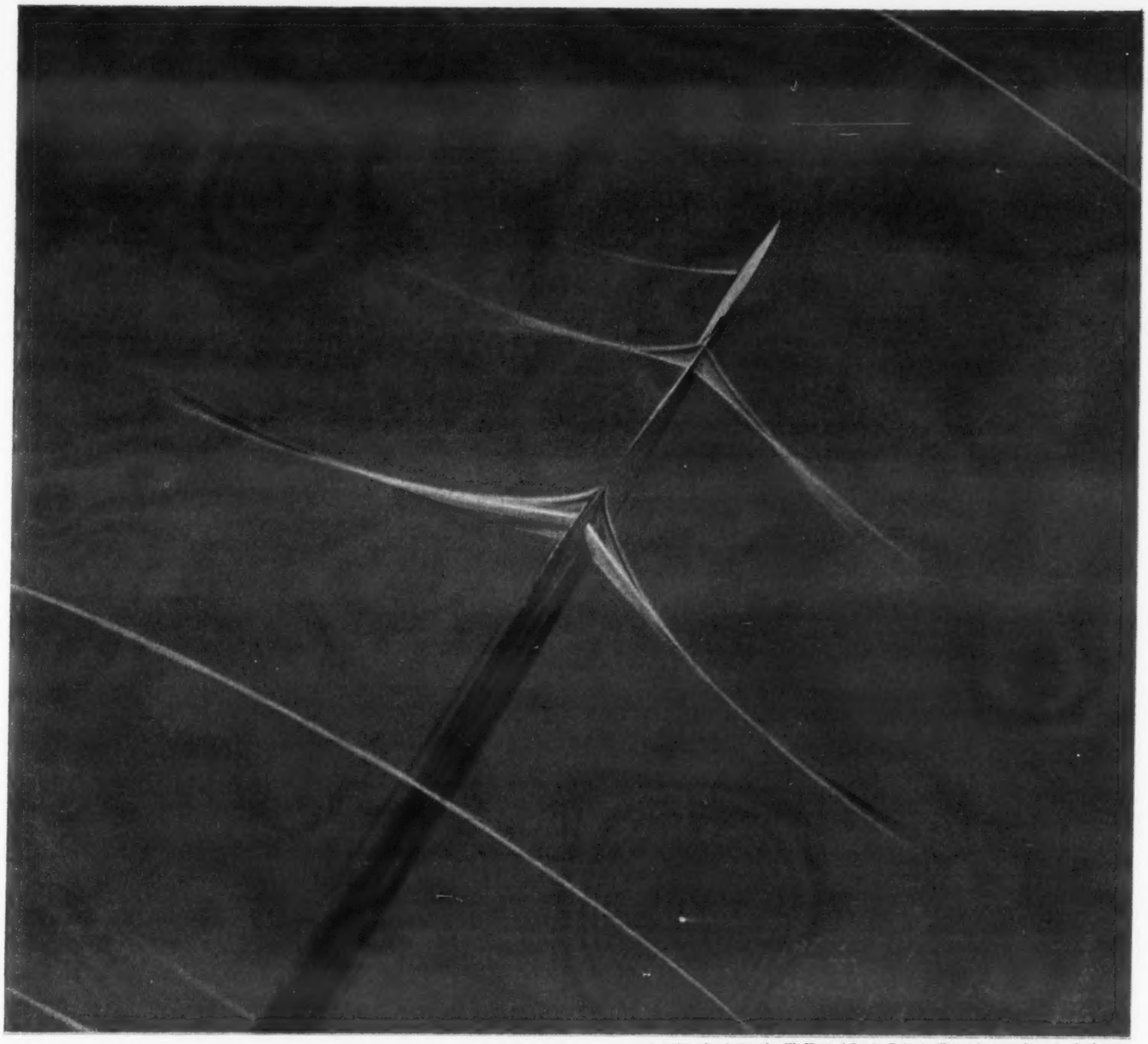
7 — Prince Michael of Rumania. **8** — The Shah of Persia (at the controls of a *Djinn*). **9** — Georges Héreil (President, Sud-Aviation) and colleagues. **10** — The Right Honourable Duncan Sandys, Britain's Minister of Defence (right). **11** — Lieutenant General E. M. Beletzki, Deputy Managing Director of Aeroflot, touring the Static Show. **12** — Igor Sikorsky.

DE HAVILLAND ENGINE RESEARCH SPEEDS THE WAY AHEAD



A series of paintings by W. Howard Jarvis, S.Av.A., illustrating aerodynamic shock-waves

M = 1·05

No. 1

The shock pattern which occurs at speeds just above the velocity of sound. The bow-wave, as yet unattached, is seen ahead of a climbing aircraft and strong shock waves with flow separation have already appeared on the wings and tail. The rear shock waves give an impression of the Mach cone formed by the aircraft's passage through the atmosphere.

DH ENGINES

GYRON GYRON JUNIOR SPECTRE

FOR THE
AIR FORCES OF
FRANCE
AND N. A. T. O.

AIR-EQUIPEMENT

PRODUCES:

Shock absorbers and hydraulic jacks for landing gears

Oxygen regulators and liquid-oxygen installations

De-icers

Electric starters
Cartridge-type starters for gas turbines
Liquid-fuel starters for gas turbines
Compressed air installations
Turbine fuel systems and fuel controls

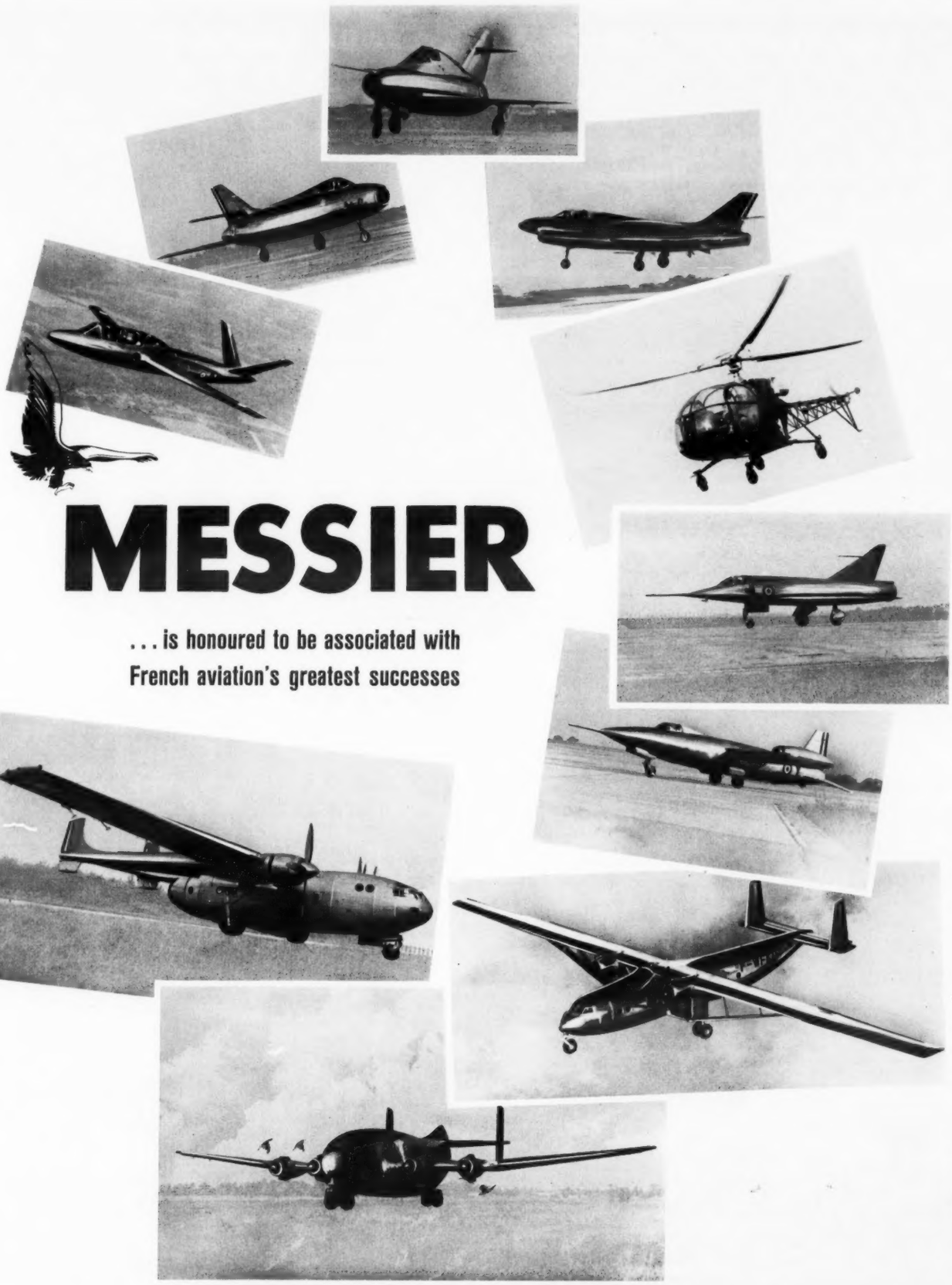
Autosyns and low-inertia electric motors
Voltage regulators
Radio compasses
Medium-wave and short-wave telecommunications equipment

Gyroscopic horizons
Pressure transmitters and indicators
Turn-and-bank indicators
Magnetic compasses
Rate-of-climb indicators

AE

AIR-EQUIPEMENT

18, RUE BASLY
ASNIÈRES-SEINE
FRANCE



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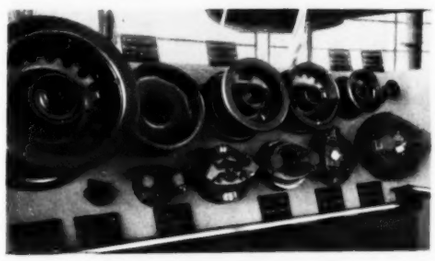
The Equipment Industry at the Salon

Although the equipment industry's exhibits are generally less spectacular than the airframe and engine industry's products shown in flight, the 22nd Paris Show nevertheless once more provided ample evidence of the fact that the accessories industry has advanced to a unique key position in modern aircraft production. Obviously the following pages can give only a modest idea of the new developments and production items shown. Other exhibits will, therefore, be discussed in forthcoming issues under the "Equipment Round-Up" feature.

The classification of so wide a variety of products under only five headings will doubtless appear arbitrary, particularly as the production programmes of some manufacturers cover the whole range of aeronautical equipment. The tendency of the large airframe manufacturers to engage more and more in the development of complete airborne systems and to take the creation of weapons systems into their own hands is unmistakable.

Airframe Accessories

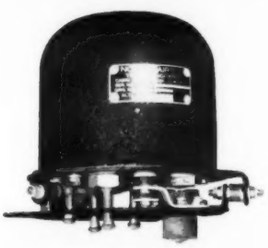


● **Messier,** Montrouge, France: Wheel hubs and brake systems from the production programme of this well-known French undercarriage manufacturers. Top row, left to right: wheels for the following aircraft: Breguet 765 *Deux Ponts*, Sud-Aviation SO. 9050, Hurel-Dubois HD. 34, undisclosed aircraft, Fouga CM. 170 *Magister*, SE. 3130 *Alouette*. Bottom row, right to left: the brake systems for the above-mentioned wheels.

● **Bristol Aircraft Ltd., Weston Division,** Oldmixon and Banwell, England, showed a selection of high-pressure containers for pneumatic energy, including a spherical pressure vehicle of glass fibre and epoxy resin (top left): capacity 32.8 litres; working pressure 230 kg/cm²; weight 19 kg; inside diameter 393.7 mm. Next to it (top right) a spherical pressure vehicle of chrome molybdenum steel heat treated to 130 kg/mm²; capacity 17 litres; working pressure 210 kg/cm²; ultimate pressure 4.78 kg/mm²; weight 8.6 kg; diameter 320 mm.

Of late the Weston Division has been making rocket motor cases of glass fibre impregnated with epoxy resin. The cylindrical cases are joined to the light metal rocket pipes by a process not described in detail, and are fully equal in strength to all-metal cases. Tests at Bristol have furthermore revealed that light-metal cases for solid-propellant rocket motors can be lined with Durestos.

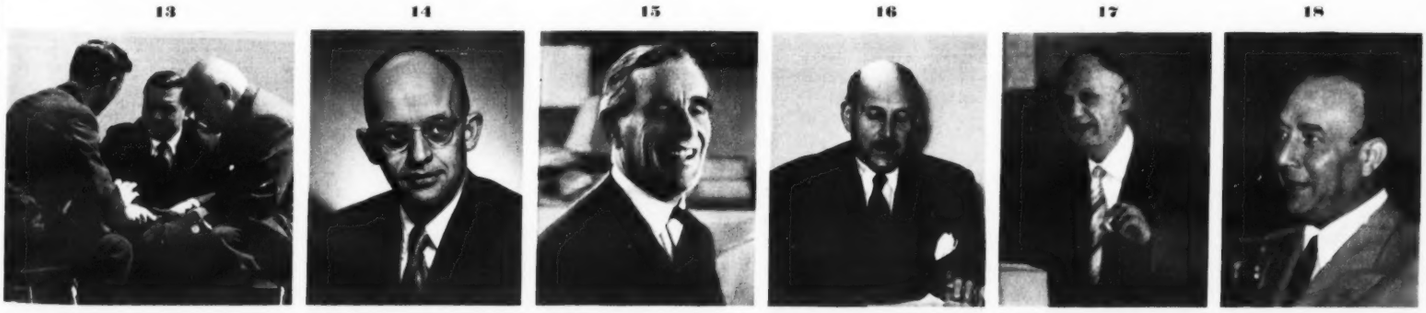
● **Hispano Suiza,** Bois-Colombes, France, has developed a new dual performance pump with a delivery rate of 3 litres/min at a pressure of 210 kg/cm², and 8 litres/min at 80 kg/cm². Driven by an electric motor, it is suitable for use as auxiliary pump for the operation of flaps and control surfaces.—Dual performance pumps of this kind are required in particular in high-speed aircraft, as the controls for flaps and surfaces need small flows and high pressure at high flying speeds and large flows and low pressure at low speeds (particularly in cross winds). Other exhibits: electrolytically polished cast and pressed parts and hydraulic installations for a temperature range of between —50°C and + 150°C.



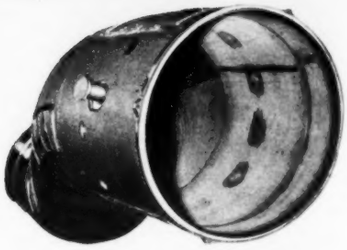
● **Normalair Ltd.,** Yeovil, England: Light-weight pressure controller Type H (top) for fully automatic cabin pressure regulation, supplied by Normalair for a large number of aircraft types. With its weight of only 1.75 lbs., this space-saving equipment (diameter 4½ ins.) can be accommodated easily even in small cockpits and cabins.—Another of Normalair's products: a cooling turbine for aircraft air conditioning systems (bottom) with a flow rate of 55 lbs./min. The equipment is fed with compressed air from the compressor and has a maximum diameter of 7⅛ ins.; weight 12 lbs.

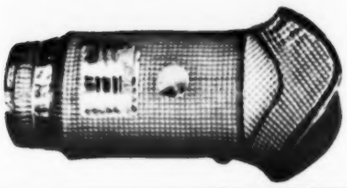
● **Microcell,** London, England: Double sleeperseats with pull-out foot-rests for first class services (left), triple seats for tourist class (centre) and the prototype of an extra light double seat made of glass fibre plastic (right) were on view on the Microcell stand. The plastic seat was developed to B.O.A.C. requirements and Ministry of Supply specifications; the makers claim that it is roughly 15 lbs. lighter than comparable metal seats.

13 **14** **15** **16** **17** **18**



13 — A Dornier family group, right to left: Prof. Dr.-Ing. Claudius Dornier, Dipl-Ing. Claudius Dornier Jr., Dipl-Ing. Silvius Dornier. **14** — George S. Schairer, Assistant Chief Engineer, Seattle Division, Boeing Airplane Company. **15** — J. J. Parkes, Chairman and Managing Director, Alvis Ltd. **16** — Marcel Dassault, head of Générale Aéronautique M. Dassault. **17** — Prof. Dr. J. Ackeret, Aerodynamics Institute, Federal Institute of Technology, Zurich. **18** — Prof. Dr.-Ing. Giuseppe Gabrielli, Technical Director, Fiat, Turin.





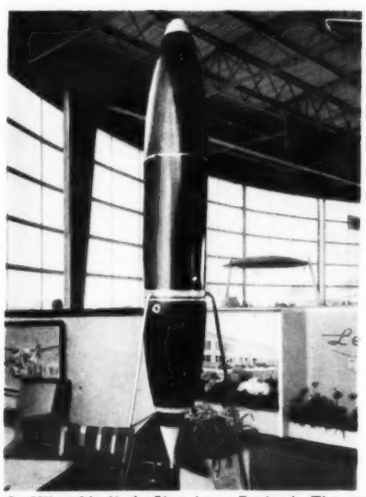
PARIS

● **The British Refrasil Company, Ltd.,** Stillington, England: Sample application for Refrasil heat insulation with protective cover of metal foil. Refrasil is a light-weight, very fine fibrous silica material (diameter range from 0.0002 to 0.0004 ins.) which withstands a continuous temperature of 1,000°C and possesses outstanding thermal insulation qualities. It is also an excellent high temperature electrical insulator. Originally developed in the United States, Refrasil insulation is now used for a wide variety of applications in the British aircraft industry (for jet pipes, combustion chambers, electrical insulation of high temperature parts, etc.). For applications where fuel must be prevented from entering the insulation material, the insulating layers are enclosed in 0.003 to 0.004-inch seam-welded metal foil (see pictures).

It has been found that a ½-inch thick blanket is the most satisfactory for jet engine applications.

● **Simmonds S.A.,** Suresnes, France: "Pinacle" type safety nuts, self-stop nuts with nylon lining ("Nylstop" type), nuts with double thread, slotted nuts for very high temperature and special nuts of all kinds figure on the company's production programme. One of these special nuts has longitudinal and lateral play and can also be turned about a fixed point. Applications: joining of two non-parallel parts, screwing of parts in which screws and nuts do not exactly coincide in their axes.

● **Vibrachoc,** Paris, France: All-metal shock absorbers under Robinson Aviation licence, consisting in essentials of a spiral spring around a cushion of woven steel wire, and a beaker-shaped mounting. These ultra-light shock absorbers are obtainable in many different versions and sizes and are used primarily for the vibrationless suspension of electronic and precision aircraft equipment. Picture shows a dual set of Series 9,300 for the absorption of shocks in all directions. Qualities remain unchanged from temperatures of —90°C to +175°C; resonant frequency 12 to 15 c/s.



● **F. G. Miles Limited,** Shoreham, England: The recently founded subsidiary Miles Structural Plastics Ltd. produces this under-wing fuel tank for jet fighters, made of Durestos plastic.

From the Exhibitors' Catalogue

● **Andyar,** Société pour l'Exploitation des Procédés et Brevets H. André & M. Yardney, Neuilly-sur-Seine, France: Light-weight silver-zinc accumulators for starting high-performance jet engines and for the equipment of aircraft of all kinds. Miniature batteries for guided missiles; special charging equipment for Andyar accumulators.

● **Auxilec,** Colombes, France: 400 c/s converters for aircraft and missiles; 400 c/s asynchronous motors for operation at altitudes up to 50,000 ft.; aircraft A. C. generators with fixed or variable frequency, with output up to 20 kW.

● **Aviac,** Etablissements, Courbevoie, France, supplies components for electrical and mechanical remote control systems and complete servo equipment. The production programme also includes switches of various kinds.

● **Dowty Group Ltd.,** Cheltenham, England: Undercarriages with hydraulic shock absorbers; "Super Vardel" two-stage pumps for delivery pressures up to 3,000 p. s. i.; "Hydel" electrically controlled valves; single-circuit fuel feed systems for jet engines; electrical indicators, etc.

● **Dunlop,** S. A. des Pneumatiques, Paris, had a joint stand with Dunlop Rubber Company Ltd., Coventry, where it showed tyres, wheels, wheel brakes and general aircraft accessories.

● **E. F. A.,** Etudes et Fabrications Aéronautiques, Clichy, France: Chrono-barometric release, type 30, for the delayed opening of parachutes; Type 675 parachutes for airborne troops; escape parachutes of various models; cargo parachutes for weights up to 330 lbs.; anti-G suit Type 10, etc.

● **Fermeture Eclair,** Division Marston, Rouen, France: Flexible fuel tanks; antenna casings; rubber and laminated products.

● **Filotex,** Etablissements, Draveil, France: Electrical cable for radio and radar systems, "E. P. D." special cables, antenna wires, coaxial cables insulated with Teflon, compensation cables, screened cables.

● **H. B.,** Etablissements, Issy-les-Moulineaux, France: Flexible hose; hose joints; hydraulic leads for extremely high pressures and temperatures; "INOX" hose joints, etc.

● **Jacottet S.A.,** Etablissements Paul, Versailles, France, showed electrical servo systems and complete power-boosted controls with hydraulic "feel" simulators, also Jacottet-Leduc irreversible power-boosted controls and stability aids produced under SNCASO licence.

● **Kléber-Colombes,** Paris, France: In addition to high and low pressure tyres of all kinds—the latter in particular for the French light-weight fighters—the company showed a new pneumatic wing de-icer, Type 21, electrical "Altitherm" heating coatings and pneumatic cabin sealing for high-altitude flight (designation "Altitube"). Also examples of the use of "Klégécell" and "Klémocell" ultra-light cellulose substances.

● **Labinal,** Etablissements, St. Ouen, France: Automatic *electrical* rotary speed regulators for the constant-speed drive of aircraft A. C. generators (400 c/s). The equipment works at an ambient temperature of 200°C and is cooled by air at 150°C. Weight, including 15 kVA A. C. generator only 32 kg. Drive at speeds of between 3,000 and 8,500 r. p. m., with an efficiency falling from 0.90 to 0.65 as speed increases.

● **Microtecnica,** S. p. A., Turin, Italy: 400 c/s synchronous generators; 400 c/s and 60 c/s motors under Bendix licence; artificial horizon and other gyro instruments.

● **Ragonot,** Malakoff/Seine, France: 27 v D. C. motors and generators; 400 c/s motors, converters, etc.

● **S. A. F. T.** Société des Accumulateurs Fixes et de Traction, Romainville, France: No-maintenance "Voltabloc" type aircraft batteries used in a large number of French aircraft types.

● **Saint Chamond-Granat,** Courbevoie, France: 400 c/s aircraft transformers; safety relays; dynamometers; circuit breakers; temperature regulators; flow regulators for airborne air conditioning systems; honeycomb constructions; SL rivets for rapid joining of metal parts; metal bonding substances, etc.

● **S. A. M. M.,** Société d'Applications des Machines Motrices, Boulogne-Billancourt, France: Wheel brakes; hydraulic pumps; servo controls; components for high-pressure hydraulic systems; titanium sheet parts.

● **S. E. C. A. N.,** Société d'Etudes et de Constructions Aéro-Navales, Gennevilliers, France: Flexible and jettisonable kerosene tanks with capacity from 100 to 1,200 litres; oil tanks; also jet engine parts of light metal, steel and titanium, in particular seam-welded sheet parts, in the fabrication of which a seam welding machine shown on the **Sciaky** stand is used.

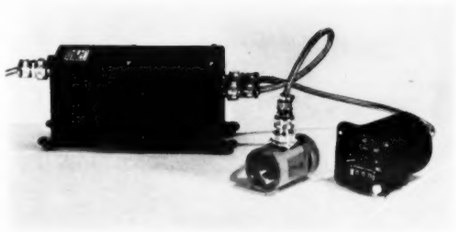
● **Souriau,** Billancourt, France: Electrical plugs; distributors; special plugs of "Cannon" and "Plessey" types; plugs for coaxial cables; junction pieces for multiple pressure leads, etc.

● **Vactric Limited,** London: Internationally standardized servo components for D. C. and A. C. and servo kits ("Breadboards") for designers of automatic operating and regulating systems of all kinds.

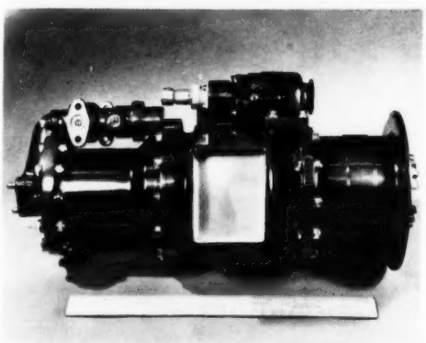
19 **20** **21** **22** **23** **24**

19 — André Granet, Secretary General of the Paris Air Show since 1909. **20** — W. H. Wicherlink, head of the Fokker Sales Department. **21** — Air Commodore F. R. Banks, Director, Bristol Aeroplane Company. **22** — Henri Desbruères, President of SNECMA. **23** — Sir Gladwyn Jebb, British Ambassador to Paris. **24** — Major General (retd.) Adolf Galland.

Engine Accessories

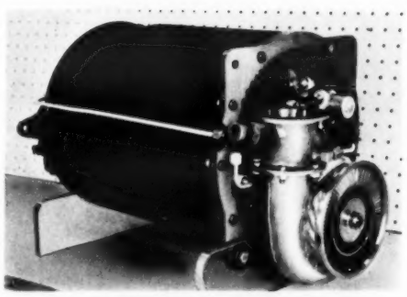


● **Faure-Herman,** Etablissements, Boulogne-Billancourt, France: Electronic flowmeter consisting of a flow measurer, an electronic counter and an indicator instrument. The fluid flow causes a flywheel to rotate at a speed proportional to the flow per unit time. With the aid of a magnetic coil and a small magnet in one of the screw wings, an electrical signal corresponding to the speed and hence to the flow rate is produced and evaluated in the electronic counter, finally being displayed on the indicator. Both rate of flow per unit time and remaining fuel supply can be read off.



● **General Electric Company,** New York, U.S.A.: This turbopump fed by compressor air works fully automatically and delivers intermittent hydraulic energy for the operation of undercarriages, landing flaps, bomb doors, etc. The 35-lb. equipment works as follows: a single-stage axial turbine at the front of the pump housing directly drives a ball-piston pump integral with a centrifugal pump and is automatically switched on or off depending on demand. Thanks to the use of extremely light titanium turbine buckets a very low moment of inertia is obtained, and the full speed of roughly 25,000 r. p. m. can be reached in very brief time. To avoid cavitation in the ball-pump the hydraulic fluid from the reservoir (15 psig) is first pre-compressed in the centrifugal pump (to 80—100 psig) and then fed to the inlet of the ball-pump, which delivers it at a pressure of 3,000 psig to the system. Delivery rate 8 gals./min.

● **The de Havilland Engine Company Ltd.,** Leavesden, England, produces a hydrogen peroxide starter for turbine engines which, thanks to its compact structure, can be fitted inside the engine's intake hub. Operation: the hydrogen peroxide, stored in a pressure container, is supplied to a catalyst pack and is decomposed into superheated steam and pure oxygen at a temperature of 600°C. This gaseous mixture is directed to a single-stage high-speed turbine, accelerating the latter up to a maximum speed of 70,000 r. p. m. The turbine in turn drives the engine through a two-stage epicyclic gear (reduction ratio 16 : 1). After pressure reduction in the starter turbine, both steam and oxygen flow into the engine compressor and mix (being non-corroding gases) with the intake air.—Length of starter 15.6 ins., diameter 5.8 ins., weight 46 lbs.



● **Armstrong Siddeley Motors Ltd.,** Coventry, England, produces a series of auxiliary gas turbines to provide shaft power or compressed air for driving electrical or hydraulic aircraft systems, etc. The GTCP-100 auxiliary gas turbine shown here delivers shaft power, compressed air or the two combined, as required. Max. shaft power is 150 h. p.; used as compressed air generator it delivers a maximum of 115 lbs. of air per minute. Typical combinations are 32 h. p. shaft power plus 100 lbs. of air per min. at a pressure of 54 p. s. i. The system works at an altitude of up to 50,000 ft., weighs roughly 235 lbs. and has a fuel consumption of approx. 246 lbs./hr at full power.

From the Exhibitors' Catalogue

● **A. B. G.,** S. A., Paris, France: In addition to spark plugs and ignition systems for piston engines, the company's production programme includes igniters (Type 1703 J) and complete ignition systems for jet engines, magnetos, test equipment for spark plugs (M. 591, M. 652, 62.500, etc.), fire warning systems and fittings.

● **A. M. A.,** Etablissements, Levallois-Perret, France: Electrical revs. counters (see picture), thermometers, pressure gauges, kerosene and oil filters and various hydraulic equipment figure on this firm's production programme.

● **Bronzavia S. A.,** Courbevoie, France: Among the very long list of products exhibited mention should be made of powder gas turbines; turbo-generators; turbo-pumps; servo systems; carburetters; fuel pumps and fuel regulators for SNECMA *Atar* jet engines; also VHF and UHF radio equipment; telemetering equipment; optical equipment; general airframe accessories of the most varied kinds.

● **Chausson,** S. A., des Usines, Asnières, France, has developed an air/kerosene heat exchanger for the SNECMA *Atar 101 B/9* engines. Of light metal construction, the heat exchanger weighs only 5.7 lbs.; max. tested oil pressure 71 p. s. i. Chausson's production programme also includes temperature regulators, air and fuel pre-heaters and oil coolers for piston and turbine engines.

● **Delord,** Société Industrielle M. & A., Paris, produces mechanical and electrical engine instruments in large numbers for the French Air Force. Pre-production batches of several metal and flame temperature gauges for temperatures up to 800°C and various pressure transmission systems are now being built.

● **Rotol Ltd.,** Gloucester, England: Propellers for the Rolls-Royce *Dart* turboprop, compressed air turbines, retractable ram air turbines, fuel flowmeters for turbine engines, servo controls and pumps of all kinds figure on Rotol's production programme. In addition to examples from this extensive programme, the firm showed undercarriage units for the *Gnat* light-weight fighter and the *Britannia*.

● **Sofrance S. A.,** Limoges, France: Kerosene filters for filter pressures of 6 to 8 kg/cm² and flow rates of up to 65 m³/hr; water separators; special filters, etc.

● **United Aircraft Export Co.,** East Hartford, U.S.A., showed, among other items, products from the Hamilton Standard Division, including fuel flowmeters, starters, air conditioning systems, hydraulic pumps, Kellstrom generators, vibration exciters and other test equipment.

● **Zénith,** Société du Carburateur, Levallois-Perret, France: Carburetters of various models (including under Hobson licence); pressure refuelling equipment under Flight Refuelling licence; pressure reduction valves for the pressure ventilation of fuel tanks; turbo-pumps; electrically controlled valves, etc.

25 26 27 28 29 30

25 — Henri Ziegler, Managing Director of Avions Breguet. **26** — Norman V. Clements, United Aircraft Corporation. **27** — Maurice Heurteux, Vice-President of Hispano Suiza. **28** — J. H. Davis, European Representative, Canadair Ltd. **29** — Prof. Dr. Ing. K. Thalau, Technical Director, Ernst Heinkel AG. **30** — Prof. Frid Wänström (left), Director of Research, Saab, and General de Tarlé, G. A. M. Dassault.

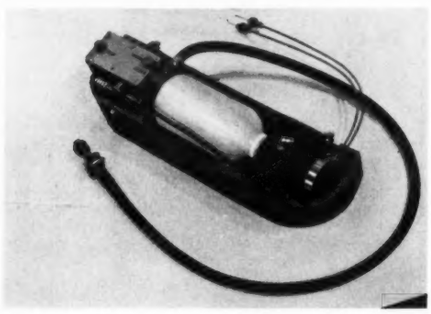
PARIS

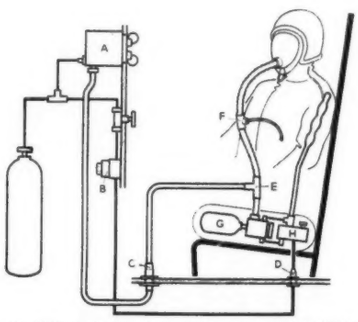
● **D. Napier & Son, Ltd.**, London, England: Rocket booster systems for rotor blade-tip installation were demonstrated in a Saunders-Roe *Skeeter*, proving their value as ultra-light take-off and climb aids for helicopters. The blade-tip nozzles are fed with steam from a hydrogen peroxide system. They are available in several versions giving a thrust of from 25 to 100 lbs. and a weight between 1 lb. and 4.8 lbs. Picture shows one of the latest versions.

● **SEMCA,** Toulouse-Aucamville, France: Turbo-cooler 3106 (left) designed to feed a heat exchanger, and turbo-cooler 3115 (right) with compressed air drive, also designed to feed a heat exchanger. Both types are used in large numbers in modern French military aircraft, so that no further details are available.

General Accessories and Safety Equipment

● **PSC Applied Research Limited,** Toronto, Canada, has put the R-THETA Navigation Computer System into production. The transistorized equipment is standard on the R.C.A.F.'s CF-100 all-weather interceptor and is now being tried out for other military and civil aircraft. R-THETA works independently of radio communications or ground stations. Automatic inputs of aircraft heading, true air speed and estimated or measured wind data are processed in the computer to give the aircraft's position in terms of distance and bearing from a reference point. The operator can alter this reference point at will, choosing the destination or the starting point of the aircraft, or even a moving target, thus allowing the R-Theta system to act as an interception computer. The system is also compatible with Doppler radio. The needs of TACAN and RMI have also been studied in the design of the indicators.

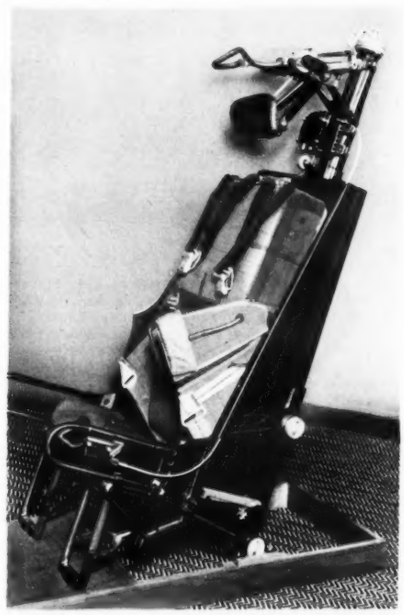




● **Intertechnique,** Boulogne-Billancourt, France: Type 219 emergency oxygen equipment, mounted on the ejection seat, to supply oxygen to the pilot and ventilate his pressure suit; can be used in conjunction with the standard Intertechnique Type 17 oxygen equipment. The emergency system comprises an oxygen container (centre) for storage pressures up to 213 p. s. i., an inhaler (left), a barometric regulator (right) to control the pressure in the helmet and suit, and several safety and blocking valves (not shown here) for separation from the standard system when the seat is ejected.

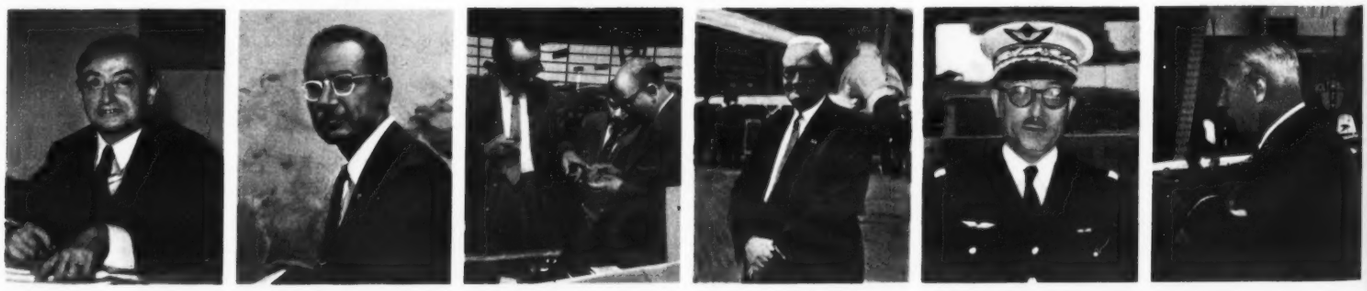
The emergency equipment can be used in the following cases: 1—failure of the main oxygen system at altitudes below 40,000 ft. (here oxygen is supplied either from the main flask or—if the latter also fails—from the emergency container); 2—failure of the cabin pressurization or explosive decompression at altitudes above 40,000 ft. (the emergency system automatically supplies the pilot's suit with pure oxygen either from the main flask or—if the latter fails or in the event of seat ejection—from the emergency container.

Key to diagram: A—inhaler of main system; B—pressure reducing valve; C and D—blocking valves; E and F—distributor valves; G—emergency oxygen bottle; H—barometric regulator for emergency oxygen system.



● **Svenska Aeroplan AB.,** Linköping, Sweden, for the first time exhibited its Mk. IV light-weight fully automatic ejection seat for the Saab 35 *Draken* supersonic fighter. This seat weighs only 55 lbs. (without backtype parachute) and is ejected at a top speed of 74 ft./sec, with the pilot experiencing a maximum acceleration of 20 g. Thanks to special design of the ejection system the seat guides take up all lateral forces arising due to aircraft roll during ejection. Seat and parachute harness are combined and are held in place by an inertia reel which enables the pilot to lean forwards. In the event of accelerations of over 3 g and of seat ejection the reel is automatically locked. To avoid injuries to the pilot's spine in a crash landing, the seat is elastically mounted.

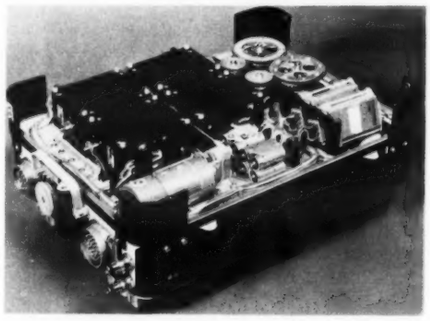
31 32 33 34 35 36



31 — Jules Jarry, President of the Association of French Aeronautical Engineers (AFITA). **32** — Mike F. Oliveau, Vice President and Regional Director for Europe, Douglas Aircraft Company. **33** — Dipl. Ing. Ludwig Bölkow (left) and Dipl. Ing. F. Nauschütz, Bölkow Entwicklungen K.G. **34** — Prof. Dr. Hendricus J. van der Maas, Chairman of the National Luchvaart Laboratorium, Amsterdam. **35** — Engineer General Meyer, French Air Force. **36** — Captain K. J. G. Bartlett, Director, Bristol Aeroplane Company.

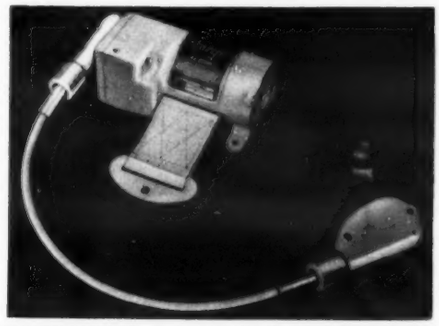
● **Sud-Aviation,** Toulouse, France: Continuing the development begun by the former SNCASO, Sud-Aviation is today engaged on the quantity production of ejection seats for the French Air Force. Almost all French military aircraft are equipped with Sud-Aviation safety equipment. In the foreground, the E. 97 fully automatic ejection seat (with spring-controlled harness) for the bombardier in the SO. 4050 *Vautour* jet bomber. Behind, the E.95 seat in a version for the Dassault *Mystère IV* jet fighter.

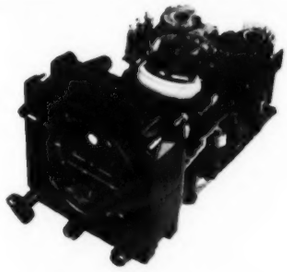
● **Service Technique de l'Aéronautique** (section of the French Air Ministry): The pilot equipment for extremely high altitudes shown here has been developed to the recommendations of the *Centre d'Enseignement et de Recherches de Médecine Aéronautique*. The pressure suit is by **Aerazur**, Paris, the helmet by **EFA**, Clichy, and the pressurization system by **Intertechnique**, Boulogne.



● **Svenska Aeroplan AB,** Linköping, Sweden, produces the BT9E electronic Toss Bomb Computer for bomb release from a dive or a turn. Designed in particular for single-seat combat aircraft, the device enables the pilot to approach the target from any direction and altitude (up to 20,000 ft.) and in the most varied attitudes. All the pilot has to do is to pick up the target in his sight and press the release switch.—The airborne equipment, consisting of the actual computer, a control unit and a position gyro, operates as follows: before take-off, the pilot feeds into the control unit (not shown in the picture) the drag coefficient of the bomb to be used, the atmospheric pressure at the target, the gross weight of the bomb carrier and the presumed wind speed. Shortly before the target approach, the gyro is unlocked, the pilot picks up the target in the sight and operates the release switch. He then pulls the aircraft out in any desired manner, while the computer automatically determines the correct release delay for the bomb, with allowance for speed, altitude, attitude and pull-out movement.—In its present version the computer works in the Mach 0.5 to 1.0 range, for diving angles of 5° to 50° and for pull-out accelerations of 3 to 7 g.

● **S.A.R.M.A.,** St. Vallier-sur-Rhône, France: Automatic harness reel, Type SR. 40, for ejection seats, made by Pacific Scientific Co., Los Angeles. With this system the pilot has sufficient freedom of movement to reach all controls without unfastening his harness. In particular the system permits the pilot to lean forward towards the radar screen. In the event of accelerations of more than 3 g in the longitudinal direction or of seat ejection the system is automatically locked. Manual control is also provided by a lever (right).—A similar harness reel is made by SARMA under the designation Type 193.





● **S.F.E.N.A.,** Société Française d'Equipements pour la Navigation Aérienne, Neuilly/Seine, France: The Type 61.1 synthetizer is designed to enable the pilot to carry out constant altitude flight, constant heading flight, change of course, and VOR and ILS flight, by determining the changes in attitude needed at any given moment to produce the required flight conditions, with allowance for existing conditions (measured by gyro compass, D/F system and altimeter) and the aircraft characteristics.

From the Exhibitors' Catalogue

● **Jaeger,** S. A. des Etablissements Ed., Levallois-Perret, France: Mechanical and electrical aircraft instruments of all kinds.

● **Omnipol,** S. A., Prague, Czechoslovakia: Flying instruments; engine instruments; test and measuring equipment.

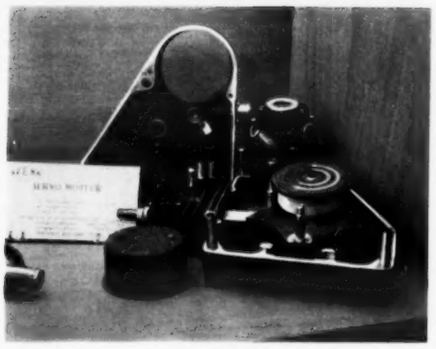
● **S. F. O. M.,** Société Française d'Optique et de Mécanique, Rueil-Malmaison, France: Type 34 aerial camera with Type 210 remote control; long focal length lenses for photographic reconnaissance; collimation telescopes for precision measurements; Type III copying machine for 240-mm film; projectors and various photographic accessories.

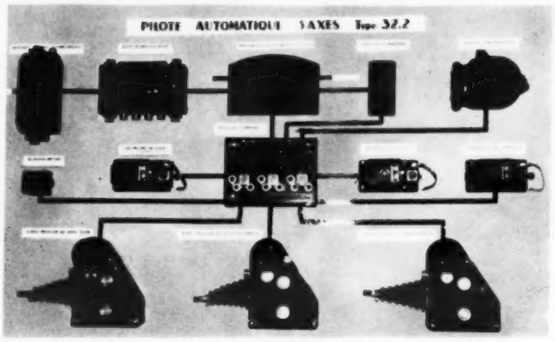
● **Sperry Gyroscope Company** (represented by *SECAL*, Paris): Autopilots; integrated instrument systems; electrical gyro horizons; gyrosyn compasses.

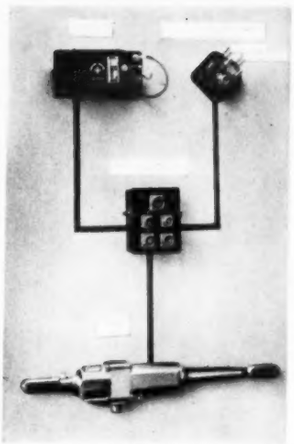
● **Stiebel-Werke,** Holzminden, Germany: Equipment for aircraft pantries, such as water heaters, electric cookers, thermos containers, etc.

37 **38** **39** **40** **41** **42**

37 – C. C. Bücker, Bad Godesberg. **38** – René Lucien, Managing Director of Messier. **39** – Gordon S. Williams, Public Relations Manager, Boeing Airplane Company. **40** – R. Birkett, British Civil Air Attaché, Paris. **41** – B. S. Massey, designer of the Bristol *Orpheus*. **42** – Dipl. Ing. Carl Francke, German representative, D. Napier & Son, Ltd.



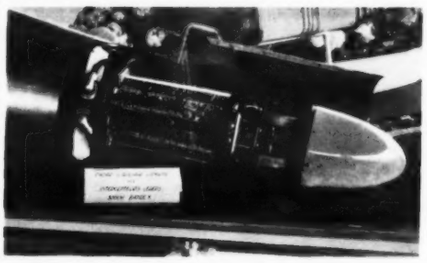




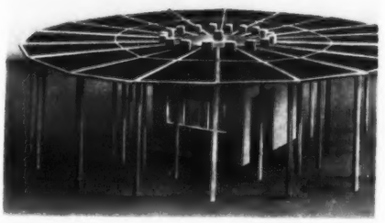
● **S.F.E.N.A.,** Société Française d'Equipements pour la Navigation Aérienne, Neuilly/Seine, France: *Top*, servo motor for autopilots, with electro-magnetic coupling and power limiter (force 330 lbs.), and Type 32.2 three-axis autopilot. *Right*, a yaw damper, Type 247 for suppression of rapid yaw in high-speed flight, total weight 10.3 lbs.

Communications Equipment

● **Avro Aircraft Limited,** Toronto, Canada (a member of the British Hawker Siddeley Group) showed the major part of the **Hughes** airborne fire control system in a model of the Avro CF-100 nose. The equipment weighs 417 lbs., occupies a volume of 15 cu. ft. and contains 211 electron tubes.



● **Dassault,** Générale Aéronautique Marcel, Paris: The fire control system for semi-active homing rockets (300 kW; X-band) built by Dassault, in the nose of a light interceptor.



● **Standard Telephones and Cables Limited,** London: Commutated Antenna Direction Finder (CADF), for use in the HF, VHF, and UHF ranges, consists of 18 omni-directional antennae arranged around the circumference of a circle and a nineteenth located either at the centre of the array or at some distance. With the VHF and UHF versions, an elevated horizontal circular metallic counterpoise is employed, measuring 25 ft. (UHF) or 45 ft. (VHF) in diameter. Features of the new D/F system: up to four frequency channels can be handled simultaneously by one antenna system; substantial reduction in site error, up to ten times as accurate as Adcock D/F systems; interference suppression by reception of strongest signal; sharp reduction of overhead "cone of confused bearings"; each channel with local and remote control; spot-frequency selection; remote information transmitted over conventional telephone lines; no rotating or continuously moving parts; built-in test facilities; VHF installation readily convertible to UHF by substitution of appropriate receiver units and rearrangement of antenna system.

● **Thomson-Houston,** Compagnie Française, Paris: The TH. D. 1225 fire control radar is now in production, after several years in the development stage. It consists in essentials of a mobile radar set working in the X-band, which supplies azimuth, elevation and distance coordinates for target tracking. Equipped with the P.H.F. 40 computer **(Compagnie Générale de Télégraphie sans Fil)**, the TH. D. 1225 equipment forms a complete unit for the fire control of medium-calibre anti-aircraft batteries.

43 **44** **45** **46** **47** **48**

43 — John B. Jacob (left), United Aircraft Export Corporation, East Hartford, Connecticut. **44** — Louis Coroller, head of SNCA du Nord's "Collège Technique". **45** — Captain John J. Ide, European Representative, N.A.C.A. **46** — J. Blanc, Technical Director, Hispano Suiza. **47** — C. Holloway, D. Napier & Sons, Ltd. **48** — Dr. Egon Jelinek, Director, Omnipol Prague (right) and Dr. Ayquesvives, Omnipol Paris.

From the Exhibitors' Catalogue

• **Air-Equipement,** Asnières, France: RCB-2 radio compass for the 200—800 kc/s frequency range. Can be used both for following a course and for position finding.—Power supply 27 v D. C.—Sensitivity: for an electrical field under 30 microvolts per metre the bearing error is less than ± 2°.—Dimensions: $4^{3}/_{16} \times 5^{3}/_{8} \times 6^{1}/_{2}$ ins.—Weight, less than 11 lbs.

Air-Equipement also showed starters for piston engines and turbines, D. C. and A. C. generators, axial ventilators, fuel pumps and regulators, radio equipment and navigation instruments, hydraulic equipment, etc.

• **British Communication Corporation Limited,** Wembley, England: multi-channel recording equipment for air traffic control purposes; ultra-light radio receiver (9 ozs.); VHF transmitter-receiver.

• **Cossor,** A. C., Limited, London: Type CR 21 mobile surveillance radar of medium range for air traffic control use, with elimination of rain, snow and permanent echoes.

• **Decca Navigator Company Limited** and **Decca Radar Limited,** London, were represented on the Compagnie Générale de Télégraphie sans Fil stand.

• **E. C. E.,** l'Equipement et la Construction Electrique, Paris: Electrical indicators; amplifiers; signal systems; remote controls; overload safety switches, etc.

• **Gebecoma,** Groupement Belge des Constructeurs de Matériel Aéronautique, Haren-Brussels, Belgium: Multi-channel magnetic tape systems for air traffic control.

• **General Electric Company,** New York, U. S. A.: Automatic pilots; X-ray equipment for materials testing; electric components; instruments; airborne radar; search radar; surveillance radar; radar altimeters, etc.

• **L. M. T.,** Le Matériel Téléphonique, Boulogne-Billancourt, France: Type AN/CRD 6 UHF homing transmitter; Type L. M. T. 141 electronic instrument flight trainer; AN/ARN 21 TACAN airborne equipment and AN/GRN 9A ground equipment (cf. *Interavia* No. 6, 1957: "TACAN combines Accurate Navigation with Strict Airspace Control").

• **Murphy Radio Limited,** Welwyn Garden City, England: Radar transponder beacon; *Rebecca 8* airborne radar for distance and altitude measuring; VHF pulse generator; VHF transmitter-receiver; voltage regulators; cabin loudspeakers, etc.

• **O. M. E. R. A.,** Société d'Optique, de Mécanique, d'Electricité et de Radio, Argenteuil, France: VHF and UHF airborne transmitter-receivers under SARAM licence; radar equipment under Decca licence; VHF talking beacon under AGA licence; camera guns and cameras for air reconnaissance under SEPHOT licence.

• **O. N. E. R. A.,** Office National d'Etudes et de Recherches Aéronautiques, Chatillon-sous-Bagneux, France: Inductive data receivers which produce a frequency change corresponding to the data change; also telemetering transmitters.

• **Philips,** S. A., Neuilly-sur-Seine, France: Multi-channel magnetic tape systems for uninterrupted operation in air traffic control centres; high-performance amplifiers (1.2 to 10 kVA) with output voltages of 100, 110, 127, 200, 220 and 254 V for frequencies between 45 c/s and 5 kc/s.

• **Radio Air,** S. A. des Applications Industrielles Radioélectriques, Neuilly-sur-Seine, France: HF transmitter-receivers with automatic continuous tuning; lightweight transistorized magnetic tape recorders; space-saving intercommunication equipment; "Radio-Mailles" grid navigation system and *Type RCM 281 subminiature radio compass* with the following features: *frequency range:* 200 to 800 mc/s (six pre-selected frequencies and one channel with manual tuning);—*types of reception:* A 1, A 2, A 3;—*applications:* automatic direction finder with operating control device;—*accuracy:* ± 2° for an electrical field strength of 100 microvolts/m;—*error correction:* enables quadrantal error to be reduced to ± 2°;—*absolute sensitivity:* defined by a permissible error of ± 10° for a field of 30 microvolts/m;—*hunting:* ± 2° maximum;—*selectivity:* at 6 db, between ± 750 and ± 550 c/s; at 60 db, ± 5 kc/s;—*gain control:* fully automatic;—*LF power:* 300 mW;—*indicating speed:* 30°/sec, minimum for 50 microvolts;—*tuning control:* by micro-ampèremeter;—*power supply:* 27 V D. C.;—*altitude:* reliable operation guaranteed up to 50,000 ft.;—*weight:* < 13 lbs.

• **Radio-Industrie,** Société Nouvelle de l'Outillage RBV et de la Radio-Industrie, Paris: Three-dimensional radar equipment for simultaneous determination of azimuth, altitude and distance of aircraft; special antennae; waveguide accessories; station equipment for radio links, etc.

• **S. A. R. A. M.,** Société d'Applications Radioélectriques a l'Aéronautique et la Marine, Asnières, France: VHF and UHF transmitter-receivers for aircraft and ground use, etc.

• **S. E. A.,** Société d'Electronique et d'Automatisme, Courbevoie, France: Type OME L2 and OME P2 analogue computers; "Servamag" magnetic amplifier for 50 and 400 c/s, also "Transmag" magnetic amplifier with transistorized pre-amplifier; "Logimac" contactless magnetic relays; flight simulators; servo systems and parts, etc.

• **S. I. N. T. R. A.,** Société Industrielle des Nouvelles Techniques Radio-électriques, Asnières, France: Type 63 A radar simulator specially designed for the training of interceptor controllers and radar operators. It can also be used for simulated manoeuvres to train controllers and fighter pilots to work together. The simulator is used either as an independent unit or in conjunction with a normal radar.

• **Sud-Aviation,** Paris, and **Compagnie Générale de Télégraphie sans Fil,** Paris, jointly organized daily direct television reporting from a *Djinn* helicopter equipped with a CSF Type CP 103 television camera. The CP 103 (shown here aboard an Agusta-Bell 47G helicopter) weighs only 2.9 lbs. It is connected via a cable to a portable 12-lb., 0.1 W transmitter. An additional 5 W transmitter, weighing 12 lbs. complete with independent power supply, is used to increase range.

• **Turck,** Etablissements Jean, Cachan, France: Infrared emitters and detectors; thermo elements and photo cells; wireless remote control equipment; telemetering and data transmission equipment; electronic counters.

• **Veam,** S. r. l., Milan, Italy: Normal and miniature junction pieces for coaxial cables; interrupters; relays; control desks, etc.

• **C. S. F.,** Compagnie Générale de Télégraphie sans Fil, Paris: TMA 403 memory tube, used in the direct transformation of radar images into television pictures (CSF Type TI 440 radar image converter). Duration of the television picture can be regulated between a few seconds and several minutes. Discrimination is such that conversion does not affect the quality of the 625-line television picture. Conversion of a radar image into a television picture has the following advantages: observation under normal lighting conditions, replacement of costly radar displays by simple television receivers, easy following of the track of an aircraft through tube afterglow, large screen projection, use of television links for transfer of the television image.

• **Marconi's Wireless Telegraph Company Limited,** Chelmsford, an associate of **English Electric Company Limited,** showed the Type AD 722 subminiaturized ADF equipment, which has been chosen for a number of N. A. T. O. light fighter prototypes. Total weight 22 lbs.—Also on view were components for English Electric's DEUCE electronic digital computer, which is already used for a wide variety of applications in the aircraft industry.

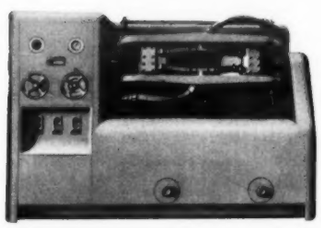
49 50 51 52 53 54

49 – Prof. Dipl-Ing. Kurt Tank and Dr. S. C. Das, Hindustan Aircraft. **50** – G. Volland, Sales Manager, Fouga. **51** – Henry F. Alioth, Manager, Pilatus Flugzeugwerke AG (right) and Derek Wood, Interavia London. **52** – Maurice Hurel, Managing Director, Avions Hurel-Dubois. **53** – C. W. Wiltsher, Publicity Manager, Alvis Ltd. **54** – Lieutenant General (retd.) Theo Osterkamp, German Representative, Fokker.

● **Derveaux,** Laboratoires, Boulogne, France, showed the electronic equipment for an interceptor in a model. Picture reveals the transmitter-receiver for the radar distance measurer (2), the Type 157, 1,750-channel UHF transmitter-receiver (5) and its control unit (17), the altimeter (6), gyro (7), computer (8) and controls (14) for setting the sight, the HF probe (9), relay (10) and indicator (13) for target approach, the radio compass receiver (18), the recording and playback unit (19) and various antennae (20, 22, 24, 25).—Bottom left, the SS 10 surface-to-surface missile made by Société Nationale de Constructions Aéronautiques du Nord, whose guidance system is produced by Laboratoires R. Derveaux.—Bottom right, model of the automatic system for the measurement and recording of antenna diagrams with which the antenna test centre at Derveaux is equipped. The system works in the 300—2,400 Mc/s, 2,400—10,000 Mc/s and 35,000 Mc/s frequency bands.

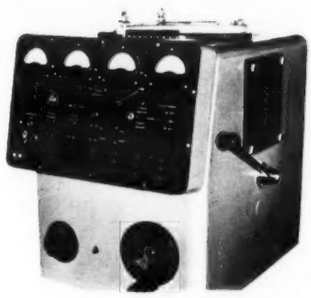
● **Bendix Radio Division,** Baltimore, U.S.A., included in its exhibits the Bendix airborne storm warning radar. Models are: RDR-1A and RDR-1B (with Racon facilities) 9,350 Mc/s (X-band); RDR-1C 5,400 Mc/s (C-band). Component weights: scanner 30 lbs., indicator 12 lbs., synchronizer 48 lbs., transmitter/receiver 40 lbs. (RDR-1C 48 lbs.), control unit 1½ lbs. RDR-1A, B, C: scanning arc ± 120°; sweep rate 15 r.p.m.; scanner tilt ± 15°; polarization, horizontal; scanner stabilization ± 25°; ranges and marks; 0—20, 0—50, 0—150 n. m. with 5, 10 and 25 n. m. range marks, respectively.

Factory Equipment and Structural Materials



● **Appareillages et Matériels de Servitude,** Choisy-le-Roi, France: Type 12M oil radiator cleaner with two motor-driven pumps which alternately flush the radiator with cleaning fluid and air. The system can clean two oil radiators simultaneously and can be adapted to fit a wide variety of radiator sizes. Other features: reversible flow direction; absolute filtering of all residues from the cleaning fluid before re-use; length 2.28 m; width 0.95 m; height 1.55 m; weight approx. 1,400 kg.

In addition the company showed a multi-purpose hydraulic test bench (Type PH-40-AU) for testing the operation of all hydraulic parts in aircraft, and for testing 28 V electro-pumps. The system includes a pressure generator for peak pressures of up to 350 kg/cm² and is driven by a 50 h. p. rotary current motor.



● **E. C. A.,** Etudes et Constructions Aéronautiques, Asnières, France: Eca. 322 gyro test equipment with turntable and tilting platform for testing altitude and rate gyros. For the latter the angular velocity of the turntable on top of the equipment casing can be regulated from 0.3 to 180 degrees/sec. An auxiliary platform tiltable between +90° and —90° enables the angular velocity measured by the sensitive axis of the gyro to be reduced to zero with the utmost accuracy.—When the Eca. 322 is used for adjusting attitude gyros a tilting platform (±15° tilt) can be mounted on the turntable in such a way that the tilt is coupled with the rotation of the turntable.—The equipment also contains an oscillating plate and an electrical transmitter for sinusoidal signals whose rhythm is determined by the movement of the turntable. These signals can be used for testing the response of servo systems at extremely low control frequencies.

From the Exhibitors' Catalogue

● **Etudes et Techniques Nouvelles,** Paris: Electronically controlled vibrating table for testing vibration resistance of materials or components in the 100 to 500 c/s frequency range with accelerations of between 0.5 and 30 g. The plate has a diameter of 30 cm and carries three T-grooves for securing the test specimen.

● **High Duty Alloys Ltd.,** Slough, England: "Hiduminium RR" forgings, including a 950-lb. main undercarriage strut of "Hiduminium RR. 77", also precision forgings of "Hiduminium RR. 58", precision castings for compressor and turbine blades of titanium, Nimonic and Hiduminium, die castings of "Hiduminium RR. 350", etc.

● **Rellumix** (formerly Rellumit), La Garenne-Colombes, France: Complete airport refuelling equipment, also fuel filters, hose couplings, water separators, flowmeters, distributor valves, etc. The company also showed fuelling systems for guided missiles using liquid propellants.

● **S.A.T.A.M.,** S. A. pour tous Appareillages Mécaniques, La Courneuve, France: Equipment for airport fuelling systems; hose couplings; flow-meters, etc.

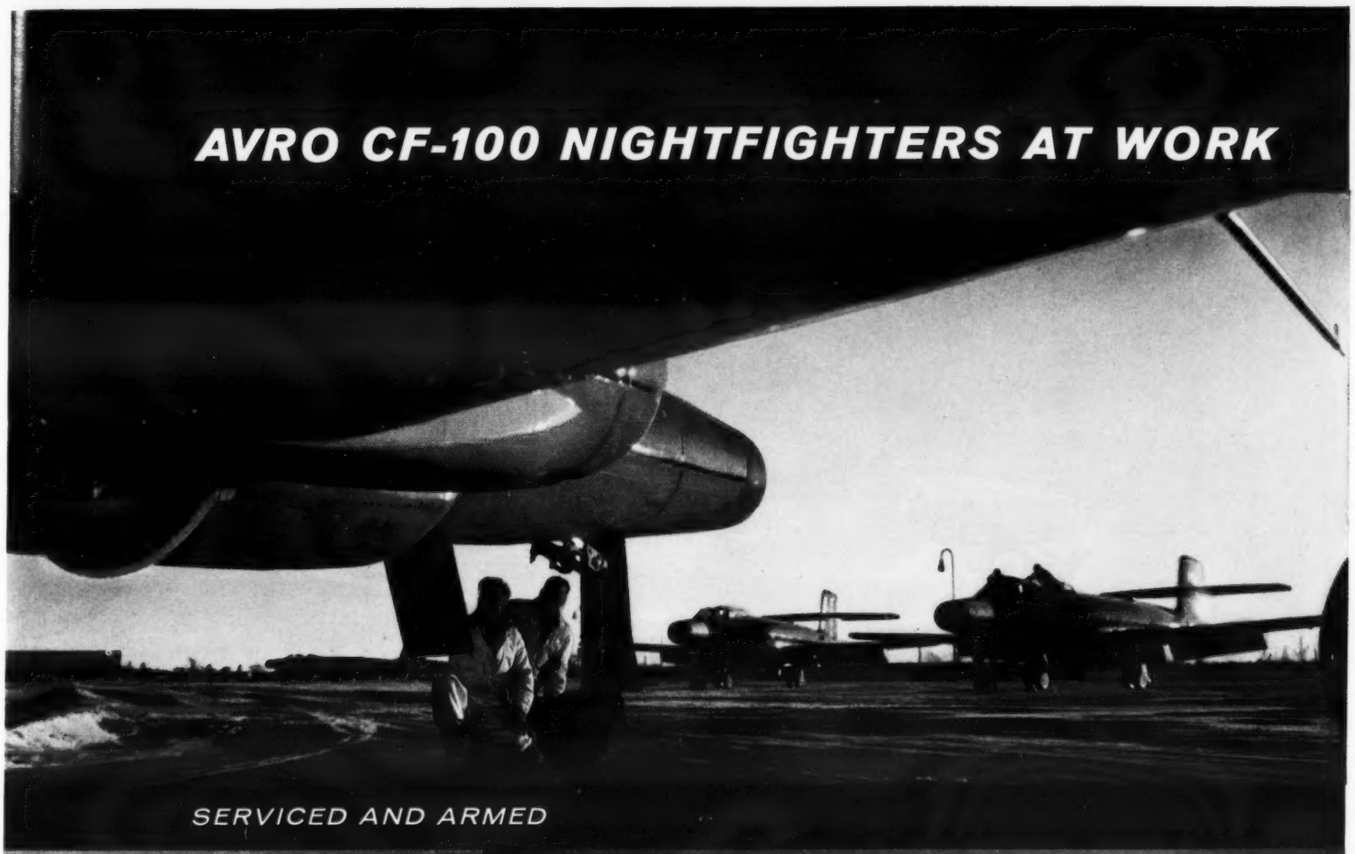
● **Ugine-Gueugnon,** Paris, showed, on a joint stand, samples of special steels, stainless steels, titanium and metal powders, as well as examples of the application of these materials.

● **Henry Wiggin & Company, Ltd.,** Birmingham, England: Applications of nickel steels in the aircraft industry, also alloys such as Mangonic, Monel and "K" Monel, and all the Nimonic alloys.

55 **56** **57** **58** **59** **60**

55 – Professor R. Müller, Dresden Institute of Technology. **56** – A. L. Kelley, General Electric Company. **57** – Prof. Dr.-Ing. Heinrich Hertel, Berlin Institute of Technology. **58** – Hans Ott, European Office, Boeing Aircraft Company, Geneva. **59** – Dipl. Ing. Siegfried Günter, Ernst Heinkel AG. **60** – Oliver Stewart, Editor, "Aeronautics".

AVRO CF-100 NIGHTFIGHTERS AT WORK



SERVICED AND ARMED

POISED

TAKE-OFF

ALOFT

ON DUSK TO DAWN PATROLS

The Royal Canadian Air Force nightfighter crews who fly these powerful CF-100's know that they guide one of freedom's most efficient weapons in the defence of North America and Western Europe.

•

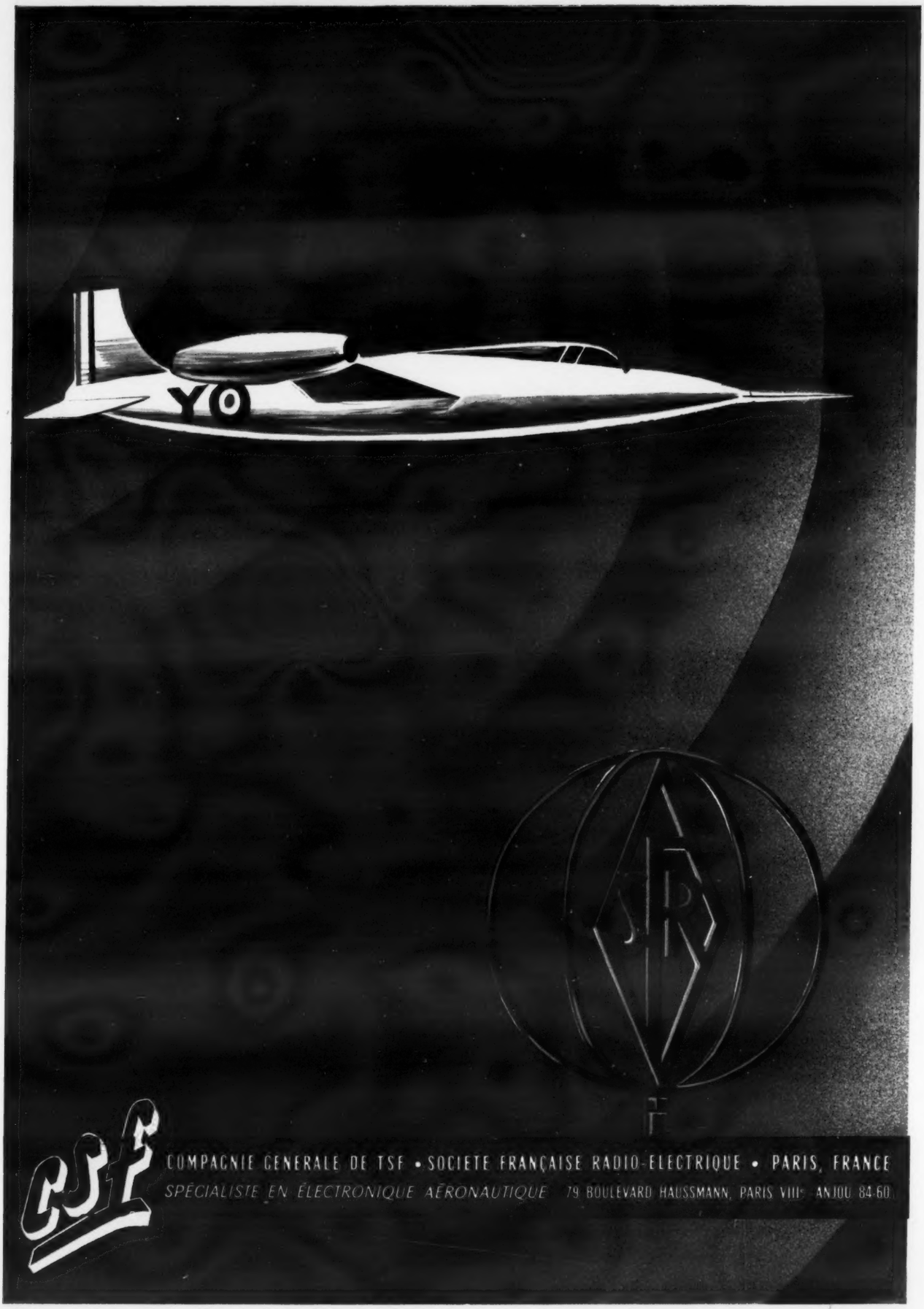
Four RCAF squadrons of CF-100's have been assigned to NATO to meet its specific nightfighter requirements.

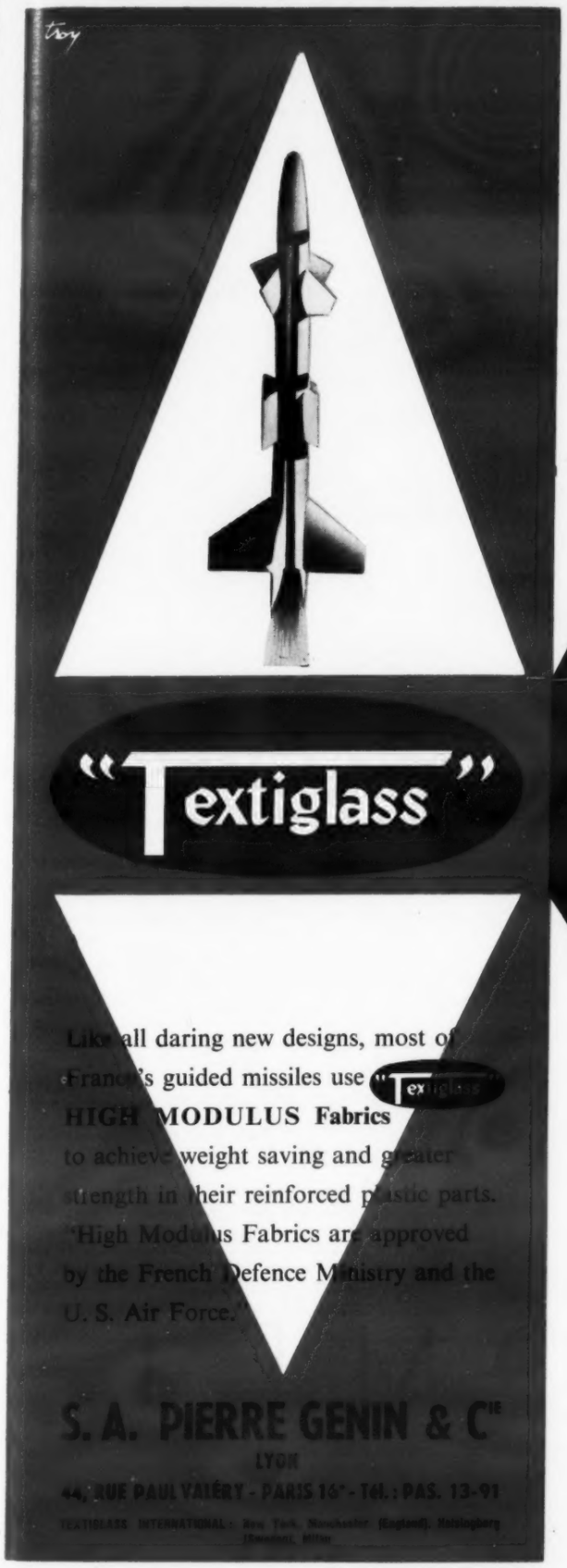
AVRO AIRCRAFT LIMITED

AVRO AIRCRAFT

MALTON, CANADA

MEMBER: A. V. ROE CANADA LIMITED & THE HAWKER SIDDELEY GROUP


YO
CSF
COMPAGNIE GENERALE DE TSF • SOCIETE FRANÇAISE RADIO-ELECTRIQUE • PARIS, FRANCE
SPÉCIALISTE EN ÉLECTRONIQUE AÉRONAUTIQUE 79 BOULEVARD HAUSSMANN, PARIS VIIIe ANJOU 84-60


"Textiglass"
Like all daring new designs, most of France's guided missiles use "Textiglass" HIGH MODULUS Fabrics to achieve weight saving and greater strength in their reinforced plastic parts. 'High Modulus Fabrics are approved by the French Defence Ministry and the U. S. Air Force.'
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Ariane T25

3-minute turn-around at the airport
545 m.p.h. along the route
Superb, incomparable comfort

The new Continental Comet has been specifically designed—and is already throughly developed—for the fast inter-city service.

It uses short runways. Its quietness has been demonstrated and acclaimed around the world.

At the intermediate stop it is self-contained: with built-in stairway, auxiliary power for built-in cabin ventilation and cooling, built-in engine starting, it needs no ground crew at all.

Its cost of operation—progressively reduced by development—rivals the propeller-turbine on stages right down to 500 miles and less.

Entirely unchallenged by any other aircraft for operation in 1959

The New Continental **COMET**

FOUR ROLLS-ROYCE AVON JET ENGINES

DE HAVILLAND

WORLD ENTERPRISE

696

Open Market for Guided Missiles

At the Paris Air Show a distinct impression was created by the open exhibition of guided missiles on stands in the Exhibition Hall and also in the Static Show on the airfield. A total of some ten different operational types was shown, partly in model form, but others in full scale, in addition to several research vehicles. A first brief pictorial survey is given in these two pages, and this is indeed the first occasion on which many of these weapons have been on show to the general public at an international air show. The August issue of *Interavia* will be a special Guided Weapons edition, and will feature a detailed report by Chief Engineer Michel M. Decker, the former French Air Force expert, on this subject.

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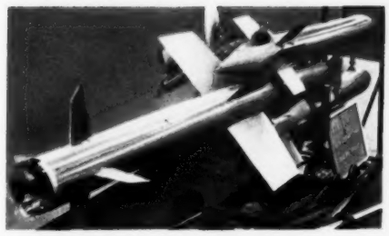
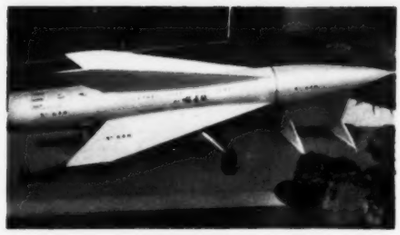
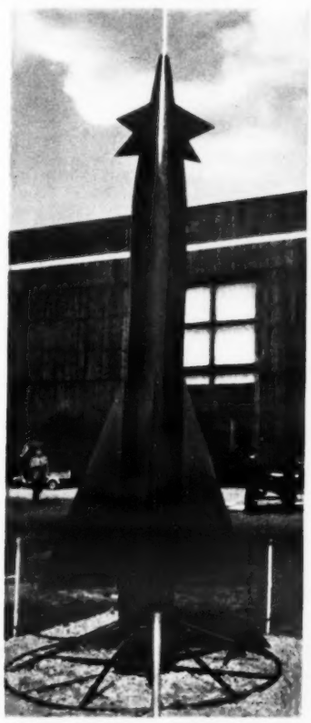




Air-to-air missiles at the Paris Show: Above left, the Fairey *Fireflash* (length 9ft 7ins; span 2ft 3ins); above right, the Nord 5103 (length 8ft; span 2ft 7ins). Below, a Matra missile, carried beneath the fuselage of a *Durandal*.

Surface-to-air missiles: Left, a *Parca* (Projectile Autopropulsé Radioguidé Contre Avions), length 14ft 7ins, span 4ft 10ins; right, two views of models of the English Electric *Thunderbird* with booster rockets: length approx. 20ft, span approx. 4ft.



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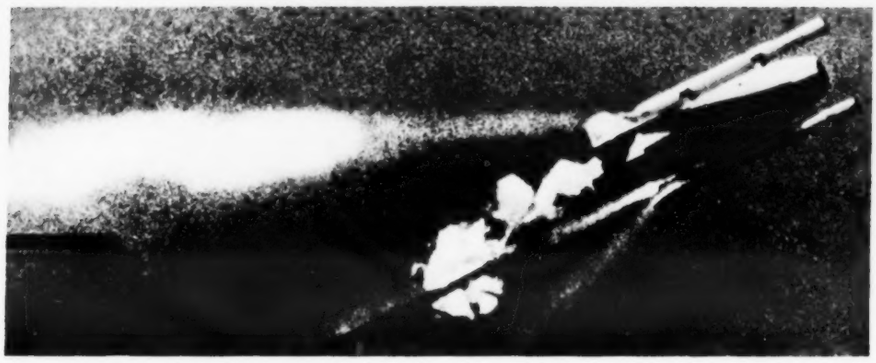
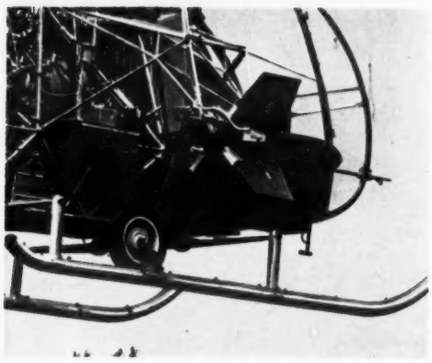
61 — A detachment from the French Naval Air Service (Aéronavale) awaiting prominent guests. **62** — Robert Roux (left, with glasses), of the USIA Press Section, conducting a Russian delegation through the exhibition; far right, Lieutenant General E. M. Beletzki, Aeroflot. **63** — The Polish delegation led by Leonard Glinski (centre). **64** — The winning crew in the B-47 "Three Capitals Prize" race organized by General Electric (Paris – Rome – Madrid – Paris, or 2,340 miles in 4 hours 12 minutes); left to right: Pilot, Captain R. E. Sheridan; Co-Pilot, First Lieutenant J. L. Monbria; Observer, Captain F. R. Beadle; Crew Chief, Sgt. E. W. Smith.



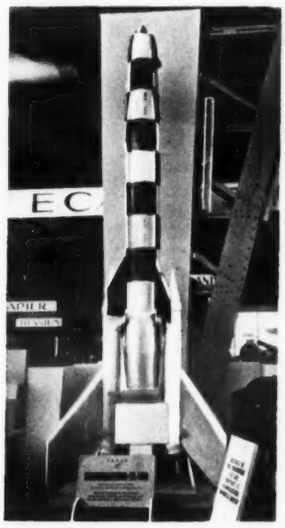
The Sud-Aviation SE.4200 subsonic ramjet missile, using two booster rockets, launched from the adjustable ramp (length 6ft 2ins, span 9ft).

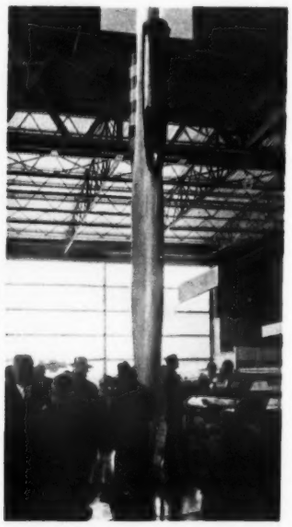


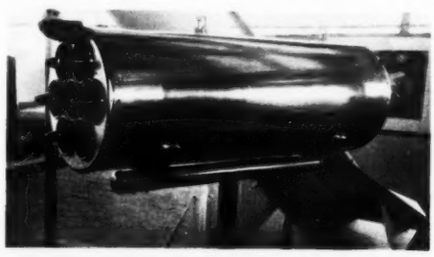
The Arsenal 5203 (SS.10) wire controlled "tankbuster", carried by a *Djinn*.

The U.S.A.F. Martin TM-61C *Matador* subsonic missile (length 39.6ft, span 28.7ft); Allison J33 jet, with booster rocket.

The U.S.A.F. Northrop SM-62 *Snark* intercontinental missile (length 68ft, span 42ft); Pratt & Whitney J57 with two booster rockets. The missile and its launching ramp were flown across the Atlantic by two U.S.A.F. Douglas C-124s.







Société Générale Matra Type M.122 rocket launcher, firing seven 68 mm air-to-surface missiles.

A selection of experimental vehicles. From left to right, the Nord ST.450 ramjet projectile, with booster; a recovered, and freshly painted original *Bobbin* research vehicle, with two Bristol *Thor* ramjets; the ONERA 320S two-stage rocket projectile, with 2012P instrument container in the nose.

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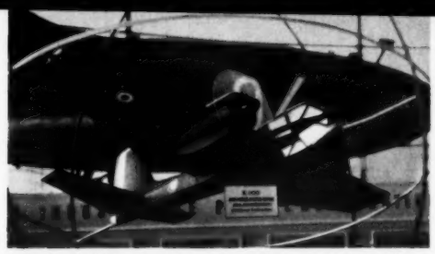
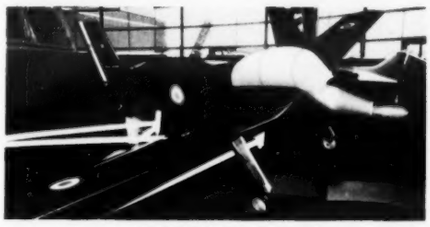
65 – Aeroflot's Chief Stewardess awaiting guests . . . **66** – who, armed with special passes, climb aboard the Tupolev Tu-104 . . . **67** – to admire its interior decoration. **68** – Me while Paris police and Aeroflot pilots discuss the relative merits of Crimean wine and "Pinard".

Le Bourget Model Gallery

The Static Show and, more particularly, the flying displays at this year's Paris Air Show were so well endowed that the relatively small number of models of projected or existing aircraft were forced to take something of a back seat. Nevertheless they did not escape the expert's attention, since they in many cases revealed the direction in which the various manufacturers are working in their new designs.—Below is a brief round-up of the most interesting of the models on show in the exhibition building.



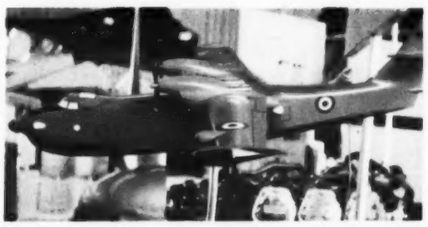
SIPA S.1100. Twin-engine multi-purpose aircraft, in particular designed for overseas operation (ground attack, reconnaissance, etc.). An order for a pre-production batch of ten S.1100s will probably have been signed by the time these lines appear in print.—Two 600 h.p. Pratt & Whitney R-1340s; max. gross weight 13,670 lbs.; max. speed 205 knots; span 48.2 ft.; length 37.1 ft.

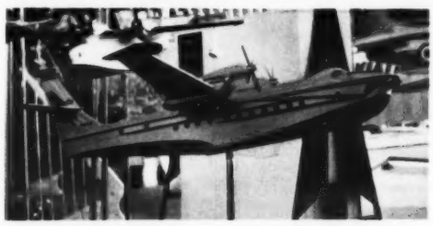


Morane-Saulnier MS.1500 Epervier. Light-weight ground attack and multi-purpose aircraft, a prototype of which is under construction and should be completed by the end of 1957. The *Epervier* can carry machines guns, small-calibre bombs and rockets or light missiles.—Main features are low initial costs and extremely low maintenance and operating costs, also the relatively high rate of climb and wide speed range.

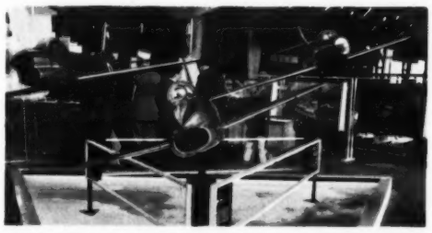
Macchi MB.326. Two-seat jet trainer for elementary training, with one Armstrong-Siddeley *Viper ASV.8* jet of 1,740 lbs. thrust. A prototype is under construction. The production version is to be fitted with a *Viper ASV. 10* (2,000 lbs. thrust). — The MB. 326 prototype is scheduled to begin flight testing at the end of September of beginning of October 1957.

North American NAA-249 (T2J). Two-seat jet trainer with one Westinghouse J34-WE-46 of 3,390 lbs. thrust (or Bristol **Orpheus**), for which orders have already been received from the U.S. Navy. A first NAA-249 is to begin flight testing before the end of the year.—Great efforts are also being made to market this aircraft outside the United States.—Gross weight 9,480 lbs.; top speed more than 400 knots; take-off distance approx. 2,010 ft.; landing d stance approx. 1,690 ft.

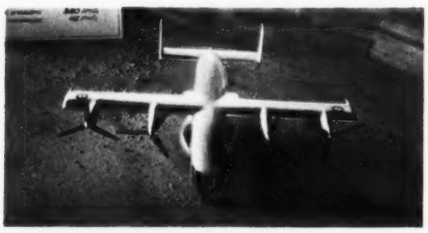




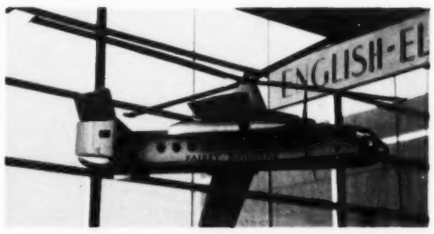
Piaggio P.155. Models of three versions of this twin-engine seaplane were shown: P.155 type SAM-1 (for sea rescue duties; left) with Pratt & Whitney R-2800 piston engine; the turboprop-powered P.155 type AS (for reconnaissance and anti-submarine missions; centre); the P.155 X (right), a civil version of the AS type, with turboprops and accommodation for 20 to 30 passengers. — Piaggio also showed the model of a new business aircraft, the P. 166.



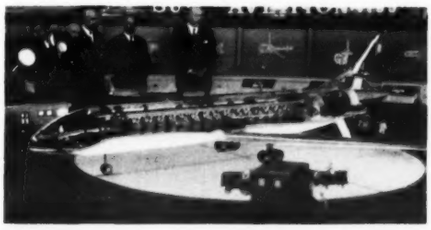
Fiat G.91. Light fighter and ground attack aircraft, from which a two-seat trainer version, G.91 T, and a photographic reconnaissance version G.91 R, have recently been derived.—In the rear, the Fiat G.82 jet trainer (right) and the Fiat (North American) F-86 K *Sabre* all-weather single-seat fighter (left).



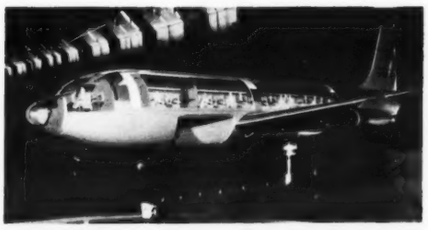
Breguet 940 Intégral. Model of a STOL aircraft scheduled to begin flight testing before the end of the year. At the moment Breguet is engaged in an extensive test programme with a special wing/powerplant combination built for the purpose.—The finished aircraft will be powered by four Turboméca *Turmo IIs* and will have a take-off distance of 115 ft., a cruising speed of 205 knots and a stalling speed of 24 knots.—The operational version of the *Intégral*—Breguet 941—is to have four General Electric T58 turboprops.



Fairey Rotodyne. A first prototype of this compound helicopter is shortly to begin flight tests. The **Rotodyne** is designed for 40 passengers and is fitted with two Napier Eland NEI.3 turboprops of 3,000 h.p. each (second prototype and production models with NEI.7 of 3,500 h.p.). A new development is that Fairey is now offering a civil version with the bigger military fuselage, with accommodation for 48 passengers or corresponding freight.



Sud-Aviation SE.210 Caravelle. Large model made of plastic to show the interior fittings of the twin-jet medium-stage commercial transport.—Pacific Southwest Airlines, a U.S. domestic operator, has announced its intention of ordering three SE.210s for delivery in the spring of 1960. By the time this issue appears in print the order should have been signed, and other contracts be in view.



Boeing 707. Four-jet commercial transport, here shown with cabin accommodation for 90+ passengers (Boeing 707-120 version with four Pratt & Whitney JT3C-4 jets of more than 10,000 lbs. of thrust each). Orders for the 707-120 model have been received from American Airlines, Continental Air Lines, Pan American World Airways, Qantas and T.W.A. Delivery dates 1959/60.

Convair 880. Medium-stage airliner with four General Electric CJ-805 jets of roughly 10,000 lbs. thrust each (CJ-805 is the civil version of the J79). First deliveries of the Convair 880 are announced for 1959/60. Orders for this aircraft, which can carry 80 to 108 passengers depending on version, have so far been placed by Delta Air Lines, T.W.A. and the Argentine airline Transcontinental S.A.

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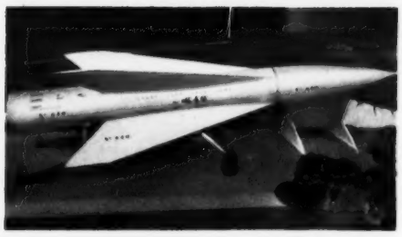

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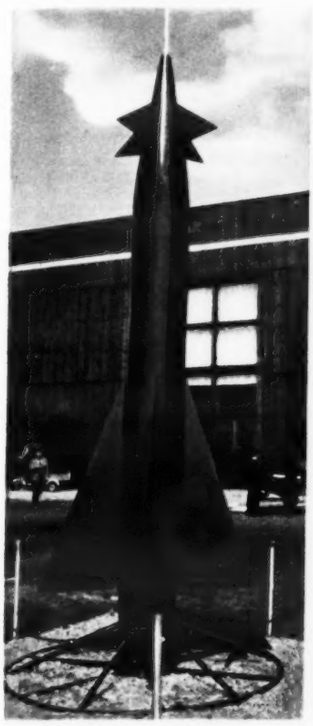

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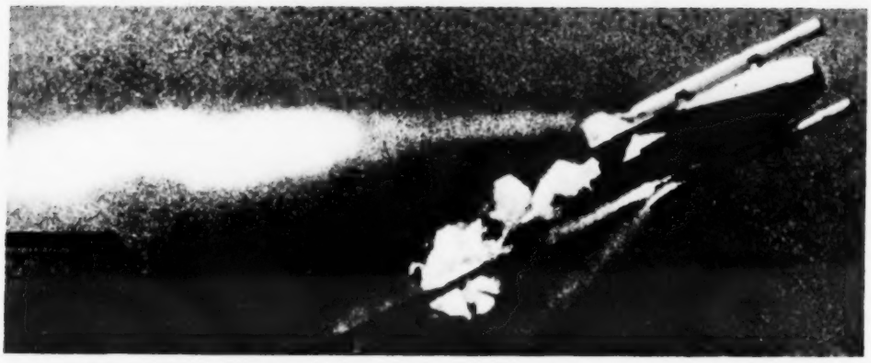
PARIS



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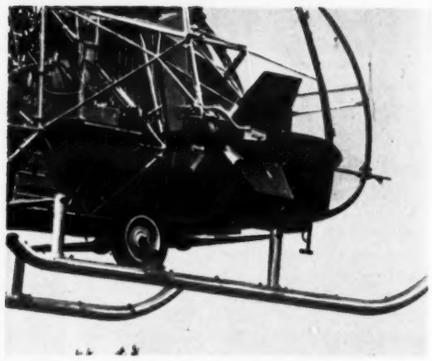

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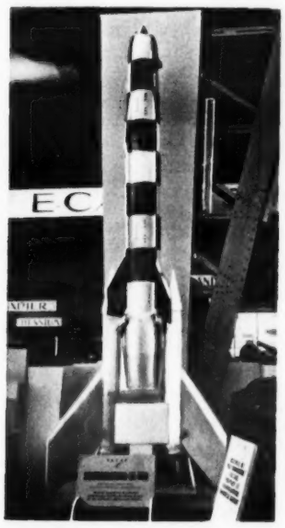

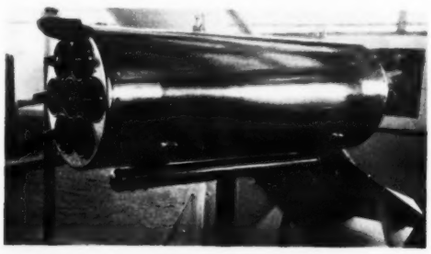

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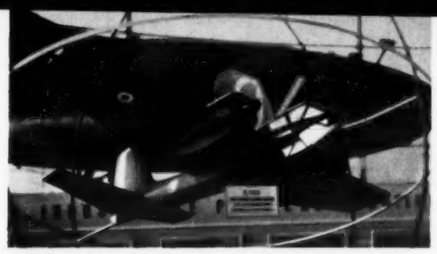
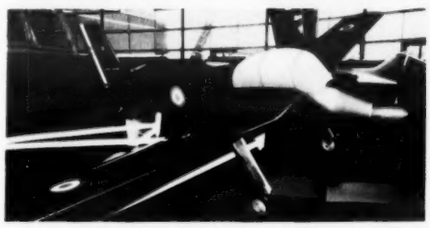
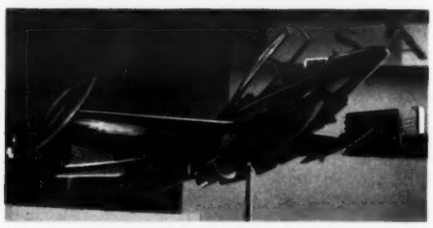


SIPA S.1100. Twin-engine multi-purpose aircraft, in particular designed for overseas operation (ground attack, reconnaissance, etc.). An order for a pre-production batch of ten S.1100s will probably have been signed by the time these lines appear in print.—Two 600 h.p. Pratt & Whitney R-1340s; max. gross weight 13,670 lbs.; max. speed 205 knots; span 48.2 ft.; length 37.1 ft.



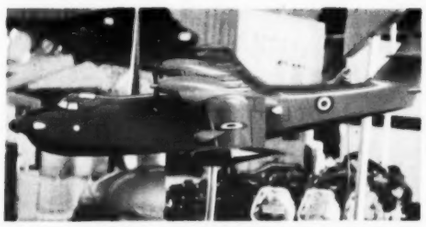
Morane-Saulnier MS.1500 Epervier. Light-weight ground attack and multi-purpose aircraft, a prototype of which is under construction and should be completed by the end of 1957. The *Epervier* can carry machines guns, small-calibre bombs and rockets or light missiles.—Main features are low initial costs and extremely low maintenance and operating costs, also the relatively high rate of climb and wide speed range.

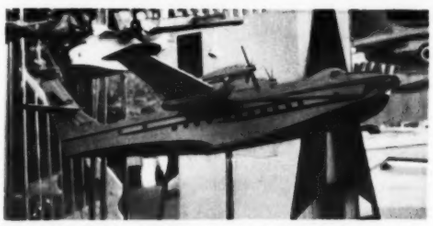
Macchi MB.326. Two-seat jet trainer for elementary training, with one Armstrong-Siddeley *Viper ASV.8* jet of 1,740 lbs. thrust. A prototype is under construction. The production version is to be fitted with a *Viper ASV.10* (2,000 lbs. thrust). — The MB.326 prototype is scheduled to begin flight testing at the end of September of beginning of October 1957.

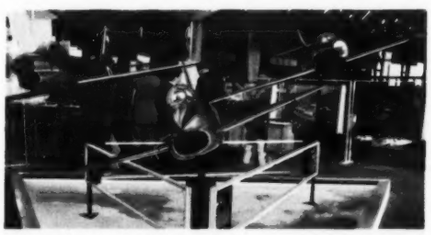


North American NAA-249 (T2J). Two-seat jet trainer with one Westinghouse J34-WE-46 of 3,390 lbs. thrust (or Bristol **Orpheus**), for which orders have already been received from the U.S. Navy. A first NAA-249 is to begin flight testing before the end of the year.—Great efforts are also being made to market this aircraft outside the United States.—Gross weight 9,480 lbs.; top speed more than 400 knots; take-off distance approx. 2,010 ft.; landing d stance approx. 1,690 ft.

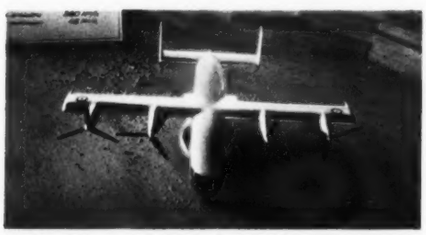
Piaggio P.155. Models of three versions of this twin-engine seaplane were shown: P.155 type SAM-1 (for sea rescue duties; left) with Pratt & Whitney R-2800 piston engine; the turboprop-powered P.155 type AS (for reconnaissance and anti-submarine missions; centre); the P.155 X (right), a civil version of the AS type, with turboprops and accommodation for 20 to 30 passengers. — Piaggio also showed the model of a new business aircraft, the P.166.



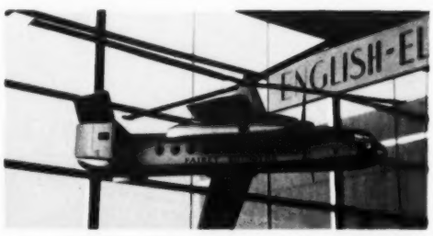




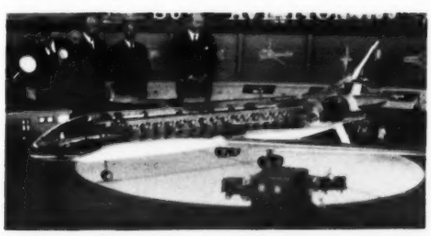
Fiat G.91. Light fighter and ground attack aircraft, from which a two-seat trainer version, G.91 T, and a photographic reconnaissance version G.91 R, have recently been derived.—In the rear, the Fiat G.82 jet trainer (right) and the Fiat (North American) F-86 K *Sabre* all-weather single-seat fighter (left).



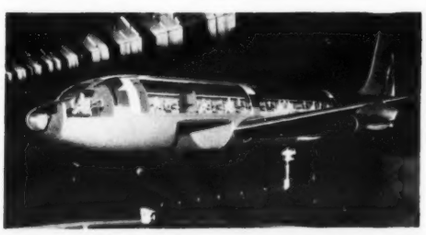
Breguet 940 Intégral. Model of a STOL aircraft scheduled to begin flight testing before the end of the year. At the moment Breguet is engaged in an extensive test programme with a special wing/powerplant combination built for the purpose.—The finished aircraft will be powered by four Turboméca *Turmo IIs* and will have a take-off distance of 115 ft., a cruising speed of 205 knots and a stalling speed of 24 knots.—The operational version of the *Intégral*—Breguet 941—is to have four General Electric T58 turboprops.



Fairey Rotodyne. A first prototype of this compound helicopter is shortly to begin flight tests. The **Rotodyne** is designed for 40 passengers and is fitted with two Napier Eland NEl.3 turboprops of 3,000 h.p. each (second prototype and production models with NEl.7 of 3,500 h.p.). A new development is that Fairey is now offering a civil version with the bigger military fuselage, with accommodation for 48 passengers or corresponding freight.



Sud-Aviation SE.210 Caravelle. Large model made of plastic to show the interior fittings of the twin-jet medium-stage commercial transport.—Pacific Southwest Airlines, a U.S. domestic operator, has announced its intention of ordering three SE.210s for delivery in the spring of 1960. By the time this issue appears in print the order should have been signed, and other contracts be in view.



Boeing 707. Four-jet commercial transport, here shown with cabin accommodation for 90+ passengers (Boeing 707-120 version with four Pratt & Whitney JT3C-4 jets of more than 10,000 lbs. of thrust each). Orders for the 707-120 model have been received from American Airlines, Continental Air Lines, Pan American World Airways, Qantas and T.W.A. Delivery dates 1959/60.

Convair 880. Medium-stage airliner with four General Electric CJ-805 jets of roughly 10,000 lbs. thrust each (CJ-805 is the civil version of the J79). First deliveries of the Convair 880 are announced for 1959/60. Orders for this aircraft, which can carry 80 to 108 passengers depending on version, have so far been placed by Delta Air Lines, T.W.A. and the Argentine airline Transcontinental S.A.

Executive Aircraft in 1957

U.S.A.: Piper *Tri-Pacer 150* four-seater (150 h.p. Lycoming engine).

U.S.A.: Four-seat Beech *Bonanza* (240 h.p. Continental).

U.S.A.: Four-to-five-seat Piper *Apache* (two 150 h.p. Lycomings).

U.S.A: Four-seat Beech *Travel Air* (two 180 h.p. Lycomings).

For years Europeans, crowded together in their small continent, have been accustomed to regarding flying as either sport or military service—except, of course, for scheduled air transport and the handful of professional pilots employed by the airlines, who amount at a generous estimate to some five thousandths of a percent of the population. When Europeans travel, they generally do so by car (patiently following the car in front) or by train, or occasionally—particularly for long distances—by regular aircraft. Anyone other than a millionaire who talks about making business trips by private aircraft is met, at any rate in Europe, by a sympathetic smile: "If you have time to spare, travel by air".

In countries with "wide open spaces", however, such as the United States, Canada, South America, Africa and Australia, there has been a veritable revolution during recent years in favour of private and executive aircraft. For example, the total United States airline fleet comprises only 1,500 units, compared with 23,000 aircraft which are used exclusively for business purposes (plus another 10,000 which are used part of the time for executive travel) [1]. Roughly 7,000 American companies own and operate nearly 11,000 aircraft, among them one oil company which has 28 [2]. In 1955 no fewer than 4,200,000 "business flying hours" were recorded in the United States, and this figure is expected to rise steadily to 7,200,000 hours by 1965 [2]. The aircraft involved operate primarily between the 6,300 of America's 7,000-odd airports which are not served by scheduled airlines [2].

The manufacture of executive aircraft has therefore become good business. Though this naturally applies above all to the U. S. and Canadian industry, there are also a number of European companies (e. g., de Havilland, Fokker, Hunting Percival, Piaggio), which have participated in the world-wide boom with substantial exports. The four major American manufacturers of small and medium touring aircraft report the following sales figures for 1956: Aero Design & Engineering $ 12,702,500 (for 159 twin-engine aircraft); Beech Aircraft Corp. $ 33,846,535 (for 694 single and twin-engine aircraft); Cessna Aircraft Co.

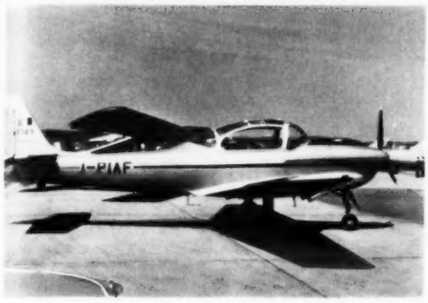
[1] Source: Aircraft Industries Association.

[2] Figures from P. E. Viemeister: "What's all this about business flying", New York, 1957.

U.S.A.: Five-seat Cessna 310 (two 240 h.p. Continentals).

U.S.A.: Five-seat *Commander 560 A*, of Aero Design and Engineering Company (two 275 h.p. Lycomings).

Canada: Twelve-seat amphibian version of the DHC-3 *Otter* (600 h.p. Pratt & Whitney R-1340).

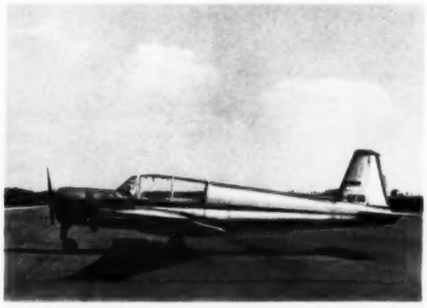


Italy: Four-seat Piaggio P.149 (260 h.p. Lycoming).

Czechoslovakia: Three-seat L.40 *Meta Sokol*, Czech State factories (105 h.p. Walter *Minor 4-111*).

Italy: Five-seat Piaggio P.136-L1 amphibian (two 270 h.p. Lycomings).

France: Four-seat PA.204 LX *Super Cigale*, Avions Paul Aubert (150 h.p. Lycoming).



Germany: Four-seat Blume Bl.502, with metal-bonded wing (150 h.p. Lycoming).

Great Britain: Standing in for the 8-14-seat *President* . . . the Hunting Percival *Pembroke* military communications aircraft (two 560 h.p. Alvis *Leonides*).

Czechoslovakia: Four-seat *Super Aero 45* built by the Czech State factories (two 105 h.p. Walter *Minor 4-111* engines).

Sweden: Four-seat Saab 91C *Safir* (190 h.p. Lycoming).

Great Britain: 10 – 13-seat de Havilland D.H.104 *Dove* (two 380 h.p. D.H. *Gipsy Queen 70s*).

$ 49,784,775 (for 3,233 single and twin-engine aircraft); Piper Aircraft Corp. $ 32,488,027 (for 2,330 single and twin-engine aircraft). The last-mentioned company delivered its 500th *Tri-Pacer* (single-engine four-seater) in March 1957 and its 1,000th *Apache* (twin-engine five-seater) in April 1957. Non-American "bestsellers" include the British de Havilland *Dove* (so far 498 sold) and *Heron* (124), and the Canadian DHC *Beaver* (approx. 380 civil models plus hundreds of military transports).

*

What actually is meant by an executive aircraft and what types fall into this category?

By common consent these aircraft begin roughly with a three-seater—or better a four-seater—which must have enclosed cabin, full instrumentation, VHF R/T equipment, night lighting and, if possible, de-icing equipment. Civil aircraft with less than three seats are classed as pure sports aircraft. At the other end of the scale, however, there is virtually no limit, since any aircraft type used by the airlines today—*Convair Liner* and *Metropolitan*, Douglas DC-6 and Lockheed *Constellation*, de Havilland *Heron* and Vickers *Viscount*, etc.—can also be used for business travel, a fact of which some of the bigger American firms are the first to take advantage. New commercial types now coming out, such as the Fokker-Fairchild *Friendship*, Handley Page *Herald* and Aviation Traders *Accountant*, are also offered from the outset in an executive version—as is even the Russo-Czech Ilyushin-Avia 14.

Between the two extremes—the three-seat sports aircraft adapted for business use on the one hand, and the airliner on the other—lies the golden mean, the bulk of the single and twin-engine models for five to twelve persons. Readers examining the table reproduced on pages 705 and 706 will also discover that this group includes the most varied selection of different models.

There is a good reason for this. Before any particular type is selected—before, in fact, any basic decision is reached on whether or not to buy a business aircraft—two main questions must be answered:

1. Who is to fly the aircraft . . . the boss, some other member of the staff with pilot's licence, or a professional pilot?

2. How many members of the staff are to be entitled to use the aircraft?

*

The number of possible answers to these two questions is large, but the number of economically sound solutions is very much smaller.

• If only the boss himself is to fly as a general rule, then the smallest and cheapest model—a three or four-seater—is expensive enough. It must be remembered that the aircraft must fly at least five hours a week, or 500 to 800 nautical miles, to reach the very modest annual utilization of 250 hours. And the boss will naturally be unwilling to play the "chauffeur" for his subordinates. He will therefore invite only those colleagues to accompany him whom he actually needs on the spot. The situation is not much different when some other qualified member of the staff acts as pilot, since he too will have to be available primarily for the boss's trips and will be obliged

to perform his normal duties more or less on the side and hence with greatly reduced efficiency.

• Thus heads of companies will normally be well advised to employ from the start a professional pilot, naturally with adequate flying experience, instrument rating and good knowledge of English for communications with control towers. In this case, however, the number of persons entitled to use the aircraft must be as high as possible, so as to ensure good annual utilization of both the aircraft and its (expensive) pilot. The size of the aircraft will then be decided according to the size of the company and the amount of travel it requires.

• To sum up it can be said that the most favourable economic solution will be obtained when:

1. a professional pilot is employed;
2. the aircraft chosen is sufficiently large and is equipped for all-weather flying;
3. the number of users is sufficiently large to ensure that the aircraft has an annual utilization of 500 to 1,000 hours—or more if possible—with a load factor of roughly 50%.

*

The table of costs, based on European standards, illustrate these arguments. The values taken for purchase price, insurance, fuel and oil consumption are rough averages, and no allowance has been made for take-off and landing charges (frequently high) and hangarage away from home.

Compared with the average rate of approx. 10 cents per passenger-nautical mile on which European tourist class round-trip fares are based, the main cost figures in this list do not show up too badly:

- 8.6 cents per nautical mile for the twelve-seater with 50% load factor and 1,000 hours annual utilization;
- 10.9 cents per nautical mile for the four-seater with 50% load factor and 250 hours annual utilization

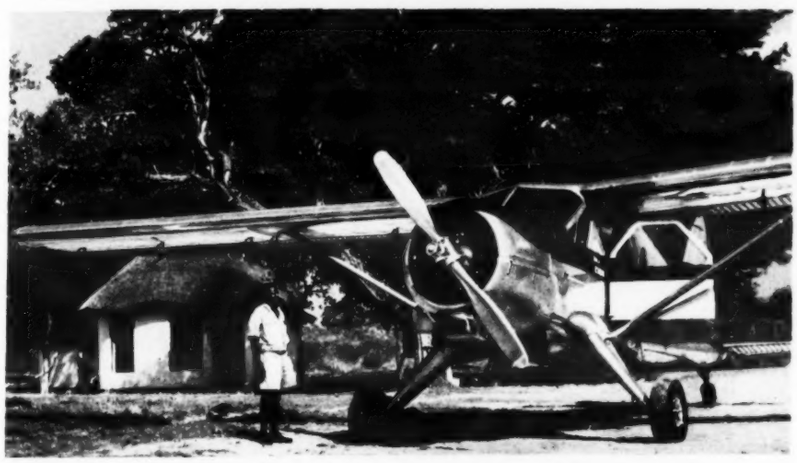
Eager Beaver in Africa

To the uninitiated the sudden appearance of the single-engine, high-wing de Havilland *Beaver* on the runways of a modern intercontinental airport might conjure up memories of Lindbergh's famous flight, or the aerobatics of "Hell's Angels". Alongside such giants of the contemporary scene as the *Seven Seas*, *Super Constellations* and *Stratocruisers*, this aircraft certainly has a somewhat "venerable" appearance. But the *Beaver* has no place on the Idlewild runways; it is as much out of its element in the world of skyscrapers, as dungarees at a White House reception.

When the locale is changed, and the aircraft is considered against the background of the tropical forests of Nyasaland and Rhodesia, a more realistic picture is presented, and the reasons for de Havilland of Canada's production figure of 380 *Beavers* over the last nine years can be appreciated; this figure is, of course, quite apart from the hundreds produced by de Havilland for service requirements, not only in Canada, but also in such widely scattered locations as Columbia, Egypt, West and South Africa, India, Indonesia, New Guinea and some 43 other states and dependencies.

In 1951, Central African Airways Corporation, a joint undertaking of the Southern Rhodesia, Northern Rhodesia and Nyasaland Governments, decided that the de Havilland *Beaver* was the answer to the problem of extending the internal network routes to serve the European inhabitants of the remoter settlements. A good example is perhaps the hamlet of Sesheke, in the Barotse district, with a total white population of four Europeans whose presence in this isolated forest area is pointless unless they are able to maintain twice weekly contact with the district capital, Lusaka. Incidentally, pilots making overnight stops in Sesheke are well advised to *taxi* around the entire clearing before attempting to take off in the morning, in order to clear the "Airport" of stray lions and other uninvited hazards.

From the beginning it was clear to the company that this "bush service" would have to be run without hope of profit, and that it was imperative to ensure economic operation with maximum reliability. The requirement was crystallised for a single-engine 4/6 passenger aircraft, robust, simple to maintain, economical in operation, weatherproof, capable of landing on the shortest of rough grass strips, and with good climbing power. The Central African Airways Corporation final decision was made in favour of the de Havilland of Canada *Beaver*, and, to date, five of these aircraft are in operation. The accompanying pictures give an impression of the types of terrain over which these aircraft are called to operate.



A de Havilland *Beaver* at Sesheke "intercontinental airport", in Northern Rhodesia.

The airstrip at Senanga has been cleared from the surrounding bushland, which provides some protection from crosswinds.

From Sesheke, a sightseeing trip to the Livingstone Falls takes one hour, and costs a modest £ 3.11.—.

Chileka Aerodrome, in the Balantyre district, is 2,500 ft above sea level, and it was from here that the first *Beaver* bush flight was initiated in 1951. The Restaurant chef watches the loading of the aircraft.

(more than this will seldom be achieved without a professional pilot).

Another point to be remembered is that a far greater number of civil airports can be reached by business aircraft than by the scheduled air services, and that the time saved by busy executives must also be allowed for in the calculations.

*

The following sample "fly away factory" prices for fully airworthy aircraft with standard equipment are given to complete the picture.

Piper *Tri-Pacer* single-engine four-seater approx. $ 10,000
Beech *Bonanza H.35* single-engine four-seater . . . . . $ 22,650
Cessna 310 twin-engine five-seater approx. $ 50,000
Beech *Twin Bonanza E.50* twin-engine six-seater . . . . . $ 88,000
Beech *Super 18* twin-engine seven-seater (with toilet) . . . . . $ 107,000
Hunting Percival *President* twin-engine 8-10-seater . . . . . approx. $ 180,000

More powerful twin-engine aircraft, such as the twelve-seat *Learstar*, cost roughly $ 300,000, while

U.S.A.: Four-seat Cessna 180 (230 h.p. Continental).

U.S.A.: Three-seat Colonial *Skimmer* amphibian (150 h.p. Lycoming).

France: Six-seat Max Holste HM.1521 *Broussard* (450 h.p. Pratt & Whitney R-985).

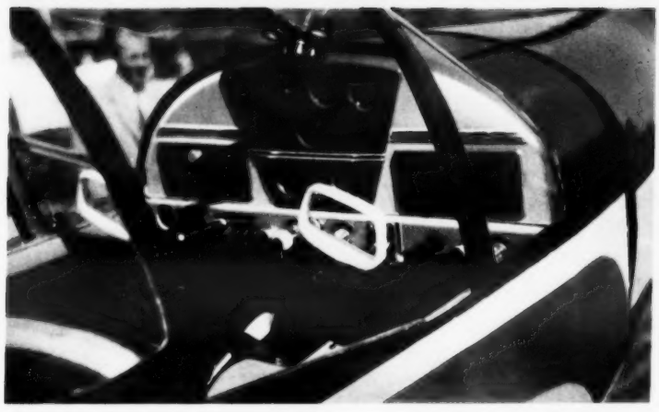
Comparative costs of three categories of business aircraft, for 1,000, 500 and 250 hours annual utilization

	Single-engine four-seater (average of two persons)	Twin-engine six-seater (pilot plus average of two passengers)	Twin-engine twelve-seater (pilot plus average of five passengers)
Initial cost of aircraft	$ 20,000	$ 100,000	$ 180,000
Annual depreciation	$ 4,000	$ 20,000	$ 36,000
Pilot's salary and travelling expenses (annual)	—	$ 9,000	$ 9,000
Annual insurance premiums	$ 200	$ 300	$ 500
Fuel and oil consumption per hour	$ 3	$ 7	$ 13
Maintenance per flying hour	$ 2	$ 5	$ 10
Annual costs for 1,000 flying hours	—	$ 41,300	$ 68,500
Annual distance flown	—	160,000 naut. miles	160,000 naut. miles
Costs per passenger-nautical mile (in cents)	—	12.9 c	8.6 c
Annual costs for 500 flying hours	$ 6,700	$ 35,300	$ 57,000
Annual distance flown	50,000 naut. miles	80,000 naut. miles	80,000 naut. miles
Costs per passenger-nautical mile (in cents)	6.7 c *	22 c	14.3 c
Annual costs for 250 flying hours	$ 5,450	$ 32,300	$ 51,250
Annual distance flown	25,000 naut. miles	40,000 naut. miles	40,000 naut. miles
Costs per passenger-nautical mile (in cents)	10.9 c *	40.4 c	25.6 c

* Costs (in cents) per *occupant*-nautical mile

U.S.A.: Ten or twelve-seat Cessna 620 (four 350 h.p. Continentals), with pressure cabin.

Great Britain: Eight or ten-seat D.H.114 *Heron Executive* (four 250 h.p. D.H. *Gipsy Queen 30s*).



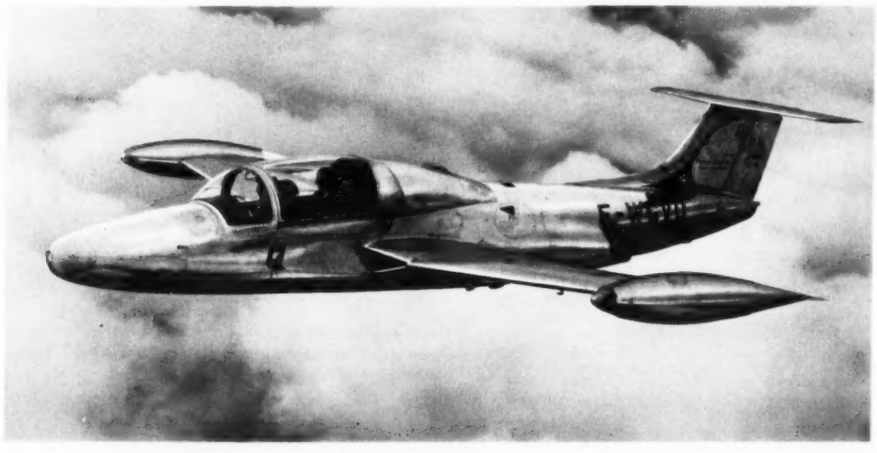
Left, the simple instrument panel of the three-seat *Meta Sokol* (with dual controls); right, the much more complicated instrumentation of a twin-engine Beech 50 *Twin Bonanza*: night flying instrumentation, VHF communication equipment, ADF, omni-range receiver, etc.

the four-engine ten-seat Cessna 620, with pressure cabin, even comes as high as $375,000.

In practice, of course, these pure catalogue prices have to be supplemented in many cases by an imposing series of "extras", all of them more or less costly but essential if the aircraft is to be capable of flying in all weather conditions. As a rule it is advisable to order them from the start, since the cost of having them installed by the manufacturers of the aircraft is lower than that of subsequent modifications. The following sample cost list is based on prices in force on December 1st, 1956:

U.S.A.: Cabin interior of the Cessna 620.

Beech *Twin Bonanza E.50*, standard version, with two 340 h.p. Lycoming engines and Hartzell metal propellers (three blades, v.p., full feathering) and night flying equipment, landing lights, cabin heater and ventilation, FAF Wichita, Kansas	$ 88,000
Extras	
Dual controls (always advisable)	$ 105
Air conditioning (useful for long trips)	$ 120
Airframe de-icing (highly recommendable)	$ 5,780
Propeller de-icing	$ 665
Engine pre-heat system	$ 405
Grimes rotating beacon	$ 165
Super soundproofing	$ 260
Auxiliary wing fuel tanks (50 gallons)	$ 2,815
Luxury seating (extra)	$ 1,000
Radio installation C (the most costly) comprising VHF transceiver, omni-range receiver (for 108—135 Mc/s), 20-channel VHF standby transmitter, audio amplifier (Flite-Tronics), VHF antenna, microphone and headset	$ 8,275
ADF (with remote tuning control)	$ 3,075
Marker beacon receiver	$ 750
Second omni-range receiver	$ 2,525
Glide slope receiver	$ 1,525
Course director	$ 2,525



France: Jet-powered four-seat Morane Saulnier MS.760 *Paris* (two Turboméca *Marboré IIs* of 880 lbs. thrust each).

U.S.A.: Mock-up of the Fairchild M-185 ten-seat jet-powered executive aircraft (under development; four Fairchild J 83 jets of 2,000 lbs. each).

All in all there are at present in service some five dozen different models of executive aircraft for from three to thirty persons. In addition there are another dozen new types under construction or undergoing tests, including several jet-powered models. All are listed in the table on the next two pages, under the following headings:

Group 1: Single-engine aircraft;
Group 2: Twin-engine aircraft;
Group 3: Four-engine aircraft;
Group 4: Jet-powered business aircraft.

It is obviously not possible to include a photograph of each of the aircraft mentioned in the table. The pictures chosen are of representative products of the U.S. and European industries, supplemented by views of a relatively simple instrument panel, and of one showing the "whole works".

RECENT EXECUTIVE AIRCRAFT

ABBREVIATIONS

1 — Countries
BRA = Brazil
CAN = Canada
CSR = Czechoslovakia
DEU = Germany
ESP = Spain
FRN = France
GBR = Great Britain
ITL = Italy
NED = Netherlands
SVE = Sweden
USA = United States

2 — Remarks
METO = Maximum except take-off
R = Normal range in nautical miles, still air
R_{max} = Maximum range, still air

Manufacturers	Type designation [Powerplant]	Take-off rating HP	Max. seats	Span m [ft]	Wing area m² [sq. ft]	Gross weight kg [lbs]	Fuel [l]	Speed Max. kn	Speed Cruising [at % METO] kn	Speed Stalling or landing kn	Service ceiling m	Remarks
SINGLE-ENGINE BUSINESS AIRCRAFT												
CAN												
de Havilland Aircraft of Canada, Ltd. Toronto, Ontario	DHC-2 *Beaver* [Pratt & Whitney R-985]	450	7	14.4 [48'0"]	23.2 [250.0]	2315 [5100]	360 +165	142	124	—	5500	R_{max} [at 5,000 ft., with fuel reserves for 45 mins] = 640 nautical miles.
de Havilland Canada	DHC-3 *Otter* [Pratt & Whitney R-1340]	600	2+9 (2+10)	17.7 [58'0"]	34.8 [375.0]	3630 [8000]	830	140	120 [66%]	—	5700	R [at 5,000 ft., with fuel reserves for 45 mins] = 830 naut. miles; max. endurance = 9.8 hrs.
CSR												
Ceskoslovenske Zavody Automobilove a Letecke, Praha	L.40 *Meta Sokol* [Walter Minor 4-III]	105	3	10.0 [32'9"]	14.5 [156.0]	840 [1850]	105	137	107	45	4000	R [economical cruising] = 460 naut. miles.
Ceskoslovenske Z.A.L.	L.60 *Brigadyr* [Praga Doris B]	220	3 [4]	13.9 [45'9½"]	24.3 [261.6]	1415 [3120]	—	103	95	28	4500	Fuel consumption, cruising = 48 litres/hr; R [at 3,280 ft.] = 390 naut. miles.
DEU												
Dornier-Werke GmbH Friedrichshafen	Do 27 [Lycoming GO-480-B1A6]	270	5	12.0 [39'4½"]	19.4 [208.8]	1500 [3310]	210	135	111 [60%]	31	5500	R = 470 naut. miles.
Ingenieurbüro Blume [Duisburg] & Focke-Wulf GmbH [Bremen]	Bl. 502 [Lycoming 0-320]	150	4	10.5 [34'5"]	15.0 [161.5]	1060 [2340]	ca. 140	133	118	43	5800	R = 485 naut. miles.
Leichtflugzeugbau Klemm GmbH Stuttgart-Böblingen	KL. 107A [Continental C90-12F]	95	3	10.9 [35'8"]	14.6 [157.1]	—	—	100	—	43	4900	R = 400 naut. miles.
ESP												
Aeronautica Industrial S.A. Madrid	AVD. 12C [Continental O-470-A]	225	4	11.1 [36'5"]	18.0 [193.6]	1300 [2865]	160	148	135 [75%]	35	6400	R_{max} = 540 naut. miles; max. endurance = 4 hrs 10 mins.
FRN												
Avions Paul Aubert Paris	PA. 204 *Cigale Major* [Lycoming]	170	4	10.0 [32'9"]	12.9 [139.0]	1160 [2550]	150	140	130	49	5000	R = 865 naut. miles.
Société Boisavia Ivry-sur-Seine	B.60 *Mercurey* [SNECMA 4 Pei]	140	4	11.4 [37'4"]	18.0 [193.6]	1000 2200]	—	127	102	32	5500	R = 595 naut. miles.
Avions Maurice Brochet Neauphlé-le-Château, S.-O.	MB. 100 [Hirth 504]	91	3	10.6 [34'11"]	14.2 [153.0]	780 1715]	—	97	89	30	3500	R = 325 naut. miles.
Avions Max Holste Paris	MH. 1521 *Broussard* [Pratt & Whitney R-985]	450	6	13.7 [45'1"]	25.4 [273.3]	2500 [5500]	—	146	124	46	5800	R = 650 naut. miles.
GBR												
Auster Aircraft Ltd. Rearsby near Leicester	*Autocar* [DH Gipsy Major 1]	130	4	11.0 [36'0"]	17.1 [185.0]	1111 [2450]	145	101	87	30	3350	R = 435 naut. miles.
Aviation Traders (Engineering) Ltd. Southend-on-Sea	*Prentice* [DH. Gipsy Queen 30-2]	250	4 [5]	14.0 [46'0"]	28.4 [305.0]	1980 [4360]	180	—	105	60	3200	R = 360 naut. miles; endurance 3 hrs 30 mins. Conversion of the Percival P.40 *Prentice* three-seat trainer.
Edgar Percival Aircraft Ltd. Romford, Essex	EP. 9 [Lycoming GO-480-B]	270	2+4	13.3 [43'6"]	—	1610 [3550]	—	127	104	33	—	R = 500 naut. miles.
Scottish Aviation Ltd. Prestwick, Ayrshire	*Pioneer* [Alvis Leonides 503/7]	540	5	15.1 [49'9"]	36.2 [390.0]	2630 [5800]	545	139	123	37	4875	R [at 105 knots and 5,000 ft.] = 610 naut. miles.
ITL												
Società Aeronautica Italiana Ing. A. Ambrosini e C., Passignano	F.7 *Rondone* [Continental C 90]	90	3 [4]	9.3 [30'6"]	10.6 [114.0]	770 [1695]	142	127	—	38	3800	R = 350 naut. miles.
Nardi S.A. per Costruzioni Aeronautiche, Milano	FN. 333 [Continental 0-470-H]	240	3	10.1 [33'4"]	14.8 [159.2]	1300 [2865]	260	157	140	55	6100	R_{max} = 800 naut. miles; amphibian, still under test.
Legnami Pasotti S.p.A. Brescia	F.9 *Sparviero* [Hirth]	240	4	10.0 [32'9"]	14.7 [158.2]	1500 [3305]	—	174	—	—	5500	Production model with 260 h.p. Lycoming engine; R = 700 naut. miles.
Piaggio & C., S.p.A. Genova	P. 149 [Lycoming GO-435-C2]	260	4 [5]	11.1 [36'6"]	18.8 [203.0]	1650 [3635]	240	152	135 [70%]	50	5200	R [with fuel reserves for 30 mins; at 6,560 ft.] = 570 naut. miles.
JAP												
Fuji Heavy Industries Ltd. Utsunomia City, Tochigi	LM-1 *Nikko* [Continental O-470-13A]	225	4 [5]	10.0 [32'10"]	16.5 [177.6]	1470 [3245]	258	160	129	46	4575	Development of the Fuji-Beech B-45 *Mentor*; R [at 2,950 ft.] = 775 naut. miles.
Kawasaki Aircraft Co., Ltd Kobe	KAL-2 [Lycoming GO-435-C2B]	240	4 [5]	11.9 [39'1"]	19.6 [211.0]	1600 [3530]	300	158	113 [40%]	47	4500	R [at 40% METO; 7,050 ft.] = 860 naut. miles.
SVE												
Svenska Aeroplan AB. Linköping	Saab 91C *Safir* [Lycoming 0-435-A]	190	4	10.6 [34'9"]	13.6 [146.3]	1215 [2685]	175	146	123	ca. 45	5100	R = 520 naut. miles.
USA												
Beech Aircraft Corporation Wichita, Kansas	*Bonanza H35* [Continental O-470-G]	240	4	10.0 [32'10"]	16.5 [177.6]	1315 [2900]	148	179	165 [65%]	50	6050	R_{max} [at 139 knots, 10,000 ft., with 148 litres] = 695 naut. miles.
Cessna Aircraft Company, Inc. Wichita, Kansas	Cessna 170/172 [Continental C145-2]	145	4	10.9 [36'0"]	16.2 [174.0]	1000 [2200]	160	120 +	105 +	45	4750	Cessna 172, w. nosewheel under-carr. and 145 h.p. Continental 0-300-A.
Cessna Aircraft	Cessna 180/182 [Continental 0-470-K]	230	4	10.9 [36'0"]	16.2 [174.0]	1160 [2550]	ca. 225	145 +	130 +	—	6050	Cessna 182, w. nosewheel under-carr. endur. with 225 l. approx. 4½ hrs.
Colonial Aircraft Corporation Sanford, Maine	C-1 *Skimmer* [Lycoming O-320]	150	3	10.4 [34'0"]	14.0 [150.6]	875 [2150]	115	108	97	44	—	Amphibian; R_{max} [at 50% METO, with 150 litres, 8,000 ft.] = 520 naut. miles.
Helio Aircraft Corporation Norwood, Massachusetts	H-391 B *Courier* [Lycoming GO-435]	260	4	11.9 [39'0"]	21.5 [231.0]	1360 [3000]	225	—	136	36	7800	R = 520 naut. miles.
Mooney Aircraft, Inc. Kerrville, Texas	M-20 Mk. 20 [Lycoming 0-320]	150	4	10.7 [35'0"]	15.5 [166.9]	1110 [2450]	190	—	130 [60%]	50	5250	R [at 60% METO] = 780 naut. miles.
Piper Aircraft Corporation Lock Haven, Pennsylvania	PA-22 *Tri-Pacer* [Lycoming 0-320]	150	4	8.9 [29'4"]	13.7 [147.5]	910 [2000]	136	121	115 [75%]	43	4575	R = 480 + naut. miles; R_{max} [with auxiliary tanks] = 585 + naut. miles.
Piper Aircraft	PA-24 *Comanche* [Lycoming 0-360]	180	4	10.9 [35'10"]	16.5 [178.0]	1160 [2550]	—	—	—	—	—	
Taylorcraft, Inc. Conway, Pennsylvania	*Ranch Wagon 20* [Continental 0-470 J]	225	4	10.6 (34'8")	16.6 (178.5)	1250 (2750)	250	139	120	—	4575	Cruising endurance 5 hrs.

Manufacturers	Type designation [Powerplant]	Take-off rating HP	Max. seats	Span m [ft]	Wing area m² [sq. ft]	Gross weight kg [lbs]	Fuel [l]	Speed Max. kn	Speed Cruising [at % METO] kn	Speed Stalling or landing kn	Service ceiling m	Remarks
TWIN-ENGINE BUSINESS AIRCRAFT												
BRA												
Omareal, Ltda. Botucatu, São Paulo	*Cazmuniz 52* [2 Continental E 185-11]	370	5	13.3 [43'8"]	19.2 [207.3]	1750 [3858]	320	170	152	52	6100	Developed by Cassio Muniz S.A.; R = 650 naut. miles.
CAN												
de Havilland Aircraft of Canada, Ltd.	DHC-4 *Caribou* [2 Pratt & Whitney R-2000-D5]	2900	—	29.0 [95'0"]	85.5 [920]	10885 [24000]	—	ca. 215	160 [50%]	ca. 55	7925	Under development.
CSR												
Ceskoslovenske Zavody Automobilove a Letecke, Praha	*Super Aero 45* [2 Walter Minor 4-III]	210	5	12.3 [40'4"]	17.1 [184]	1500 [3305]	325	154	132 [75%]	—	5700	R = 810 naut. miles; fuel consumption, cruising = 11 litres/hr.
FRN												
Société Boisavia Ivry-sur-Seine	B.260 *Anjou* [2 SNECMA Régnier 4L.02]	340	5	12.8 [42'2"]	21.5 [231.4]	1870 [4125]	—	—	135	—	6000	R = 675 naut. miles.
Avions Max Holste Paris	MH. 250 *Super Broussard* [2 Pratt & Whitney R-1340]	1200	2+14 [2+17]	21.6 [70'11"]	54.0 [581]	6260 (13800]	—	196	160	—	—	Under development.
Morane-Saulnier S.A. Puteaux, Seine	MS. 700 [2 Potez 4D 33]	320	4	14.2 [46'7"]	26.5 [285.1]	2220 [4885]	—	156	140	—	6200	R = 650 naut. miles; MS. 703 six-seat version with two 200 h.p. SNECMA *Argus AS 10s.*
GBR												
Aviation Traders (Engineering) Limited Southend-on-Sea	ATL. 90 *Accountant* [2 Rolls-Royce Dart R.Da.6]	3460 TEHP	2+8 [2+14]	25.1 [82'6"]	58.7 [632.0]	12925 [28500]	5820	—	256	69	10100	
de Havilland Aircraft Co., Ltd. Hatfield, Hertfordshire	DH 104 *Dove* [2 DH Gipsy Queen 70]	760	2+8	17.4 [57'0"]	31.1 [335]	3990 [8800]	765	ca. 190	155 [60%]	—	4825	R [VFR conditions, without auxiliary tanks] = 740 naut. miles; consumption at 60% METO = 124 litres/hr.
Hunting Percival Aircraft Ltd. Luton, Bedfordshire	*President* [2 Alvis Leonides Mk.12701]	1120	2+6 [2+12]	19.6 [64'6"]	37.2 [400]	6125 [13500]	1050	192	166	ca. 70	6550	
F.G. Miles Ltd. Shoreham, Sussex	HDM 106 [2 Lycoming GO-480]	590	—	22.9 [75'4"]	25.9 [279]	3630 [8000]	—	137	106	55	5320	Under development; R [with 3,035 lbs. payload and normal fuel reserves] = 280 naut. miles; R [with 2,465 lbs. payload] = 680 naut. miles.
Scottish Aviation Ltd. Prestwick, Ayrshire	*Twin Pioneer* [2 Alvis Leonides 503/8]	1080	2+16	23.3 [76'6"]	62.3 [670]	6125 [13500]	770	145	113	45	7000	R [at 120 knots, 5,000 ft.] = 560 naut. miles.
ITL												
Aeronautica Macchi S.p.A. Varese	MB. 320 [2 Continental E 185]	370	6	13.0 [42'7"]	21.1 [227]	2500 [5500]	350	162	136 [70%]	62	4500	R [at 130 knots and 5.5 knots headwind, 6,560 ft.] = 575 naut. miles.
Legnami Pasotti S.p.A. Brescia	F.6 *Airone* [2 Walter Minor 4-III]	210	4	10.5 [34'7"]	14.7 [158]	1400 [3085]	300	162	140	49	5500	Prototype; R_{max} = 650 naut. miles.
Piaggio & C., S.p.A. Genova	P.136-L1 [2 Lycoming GO-480-B]	540	5	13.5 [44'5"]	25.1 [270]	2720 [6000]	720	159	143 [70%]	60	6000	R_{max} [at 55% METO, with 720 litres] = 915 naut. miles.
Piaggio	P.166 [2 Lycoming GSO-480]	680	6 [8]	—	—	3200 [7055]	—	—	178	—	—	Under development; R [at 178 knots, 11,480 ft.] = 810 naut. miles. R_{max} [at 154 knots, 13,120 ft.] = 1,100 naut. miles.
NED												
N. V. Koninklijke Nederlandse Vliegtuigenfabriek Fokker, Amsterdam	F.27 *Friendship De-Luxe* [2 Rolls-Royce Dart]	3200 +336 kp	2+10 [2+16]	29.0 [95'2"]	70.0 [754.0]	14950 [33000]	3700	—	238	—	10400	R_{max} [with fuel reserves for 45 mins stacking plus 200 naut. miles detour] = 1,250 naut. miles.
USA												
Aero Design and Engineering Co. Bethany, Oklahoma	*Aero Commander 560 A* [2 Lycoming GO-480-D1A]	550	5 [7]	13.4 [44'¾"]	22.5 [242.5]	2720 [6000]	590	180	173 [70%]	58	6675	R [at 55% METO, 10,000 ft., with fuel reserves for 30 mins] = 910 naut. miles.
Aero Design	*Aero Commander 680 Sup* [2 Lycoming GSO-480A1A-6]	680	5 [7]	13.4 [44'¾"]	22.5 [242.5]	3175 [7000]	1010	226	200 [70%]	62	7375	R [at 55% METO, 10,000 ft., with fuel reserves for 30 mins] = 1,285 naut. miles.
Beech Aircraft Corporation Wichita, Kansas	*Twin Bonanza E.50* [2 Lycoming GSO-480A1A-6]	680	6	13.8 [45'3⁹/₁₆"]	25.8 [277]	3175 [7000]	680	208	184 [65%]	70	7550	R [at 65% METO, 10,000 ft., with 820 litres, without fuel reserves] = 900 naut. miles.
Beech Aircraft	*Travel Air* [2 Lycoming]	360	4	—	—	—	—	—	—	—	—	
Beech Aircraft	*Super 18* [2 Pratt & Whitney R-985-14ANB]	900	2+5 [2+7]	15.1 [49'8"]	33.6 [361]	4220 [9300]	1250	203	186 [66.7%]	—	7100	R [at 66.7% METO, 10,000 ft., with 1,250 litres and fuel reserves for 45 mins] = 930 naut. miles.
Camair Division of Cameron Iron Works, Inc., Galveston, Texas	Camair 480 [2 Continental 0-470-3]	480	4	10.6 [34'8"]	17.1 [184.3]	1960 [4325]	410	185+	167+ [75%]	54	6400+	Development of the North American [Ryan] *Navion.*
Cessna Aircraft Company, Inc. Wichita, Kansas	Cessna 310 [2 Continental 0-470-B]	480	5	11.0 [36'1"]	16.3 [175]	2090 [4600]	380	190+	165 [60%]	—	6100	R [at 60% METO, 10,000 ft.] = 760 naut. miles.
Lear, Inc. Santa Monica, California	*Learstar Mk.1* [2 Wright Cyclone R-1820-76A]	2850	2+8 [2+12]	20.1 [66'2"]	51.2 [551]	10885 [24000]	4255	279	243 [55%]	82	7000	R = 3,300 naut. miles; R_{max} = 3,730 naut. miles [with auxiliary tanks].
Monocoupe Aircraft of Florida, Inc. Melbourne, Florida	*Meteor 2* [2 Lycoming 0-320]	300	5	11.0 [36'0"]	16.7 [180.1]	1405 [3100]	340	166	152 [70%]	—	—	
Piper Aircraft Corporation Lock Haven, Pennsylvania	PA-23 *Apache* [2 Lycoming 0-320]	300	5	11.3 [37'0"]	19.0 [204]	1590 [3500]	325	156	140 [70%]	45	ca. 6000	R [at 55% METO with 325 litres, 10,000 ft.] = 670 naut. miles.
Temco Aircraft Corporation Dallas, Texas	*Riley Twin* [2 Lycoming 0-340]	340	4	10.3 [33'10½"]	16.6 [178.3]	1635 [3600]	545	156	140 [70%]	ca. 50	6100	Older development of the Ryan *Navion.* R [at 70% METO, with wing-tip tanks] = 1,040 naut. miles.
FOUR-ENGINE BUSINESS AIRCRAFT												
GBR												
de Havilland Aircraft Co., Ltd. Hatfield, Herts.	DH 114 *Heron* [4 Gipsy Queen 30 Mk. 2]	1000	2+6 [2+8]	23.3 [76'6"]	46.4 [499.0]	5900 [13000]	1870	185	159 [65%]	—	—	R_{max} [VFR operations] = 1,350 naut. miles.
USA												
Cessna Aircraft Company, Inc. Wichita, Kansas	Cessna 620 [4 Continental GSO-526-A]	1400	2+8 [2+10]	16.8 [55'0"]	—	6805 [15000]	2030	245	225	—	7625	R_{max} [at 15,760 ft., with optimum cruising power] = 1,480 naut. miles. Max. endurance at 55% METO = 9 hrs; pressurized; price approx. $375,000.
JET BUSINESS AIRCRAFT												
FRN												
Morane-Saulnier S. A. Puteaux, Seine	MS. 760 *Paris* [2 Turbomeca Marboré II]	800 kp	4	10.1 [33'3"]	ca. 18 [ca. 194]	3375 [7435]	950 +450	350	305	ca. 85	10000	R [at 22,960 ft.] = 810 naut. miles.
USA												
Fairchild Engine and Airplane Corporation, Hagerstown, Maryland	M-185 F [4 Fairchild J83]	3640 kp	2+8	17.5 [57'4"]	—	12700 [28000]	—	—	ca. 480	—	—	Prototype to be completed end of 1957; deliveries beginning in 1960; cruising altitude approx. 44,000 ft.; R = 1,300 + naut. miles.
Lockheed Aircraft Corporation Burbank, California	GL-135 [4 General Electric J85]	3640 kp	2+10	—	—	—	—	—	ca. 475	—	—	Flight tests to begin end of 1957; R = 1,300 naut. miles.
North American Aviation Inc. Los Angeles, California	*Sch·elinzr* [2 General Electric J85]	1820 kp	6	12.8 [42'0"]	—	ca. 6350 [14000]	—	—	ca. 435	—	—	Flight tests early in 1958; cruising altitude approx. 44,000 ft.; R = approx. 1,200 naut. miles.

The Dornier Do 27 Multi-Purpose Aircraft

Do 27 approaching to land, shortly before touchdown.

" *Flying means landing.*" — This motto coined by Lieutenant-Colonel Siegert before 1914 is gaining added importance in today's age of high-speed flight, and the experts are increasingly turning their attention to aircraft designed for ultra-short take-off and landing. The latest among the fully tested aircraft in this category is the Dornier Do 27.

*

A cantilever high-wing monoplane, of all-metal construction, with fixed undercarriage and tail wheel, the Dornier Do 27 is powered by a 270 h.p. air-cooled Lycoming GO-480-B1.A6.

The wing, of rectangular planform with rounded tips, has a fixed leading edge slat running the length of the span, ailerons in the outer span region and landing flaps of the proven *double-slotted* type in the inner span region. Thanks to these extensive aerodynamic aids to improve maximum lift, circulation and L/D ratio (for landing), extremely good take-off and landing performance and short take-off and landing distances are obtained.

As a result of the far-sighted use of conventional aerodynamic take-off and landing aids to their utmost capacity, the aircraft is particularly suitable for operation at small, unprepared airstrips with only relatively obstruction-free approach and departure zones.

The fact that not only a very low stalling speed but also a relatively high cruising and top speed are obtained, so that the speed range is well above 4, proves the great advantages arising from the cantilever wing arrangement where reduction of drag within the whole angle of attack range is concerned. The cantilever principle, a particular feature of the Do 27 and not usually found in other special designs for similar applications today, is the main reason for the superior performance of this high-wing type.

The generous dimensions of the fixed and moving parts of the elevator and fin units, in conjunction with a relatively long fuselage ensure good stability and controllability throughout the speed range.

*

Structure : Airframe strength calculations are based on the German specifications, though overall dimensions were chosen to meet British Civil Airworthiness Requirements.

— Rupture load factor for a gross weight of 3,080 lbs. (1,400 kg) is 5.8.

— The maximum permissible gross weight for stress group 3 under the 1936 German specifications is 3,300 lbs. (1,500 kg.).

Wing unit : The all-metal rectangular wing, with constant airfoil over the whole span, is built up of two parts screwed together in the centre for easier handling. The spar is a sheet-metal box, to the forward wall of which the wing leading edge and fixed slat are attached, and to the rear wall of which the trailing edge boxes are joined. The fixed leading edge slat runs over the whole wing span, though it is built in several parts, again to simplify maintenance and repair. For the same reason the wing-tip caps are removable components screwed to the main wing.

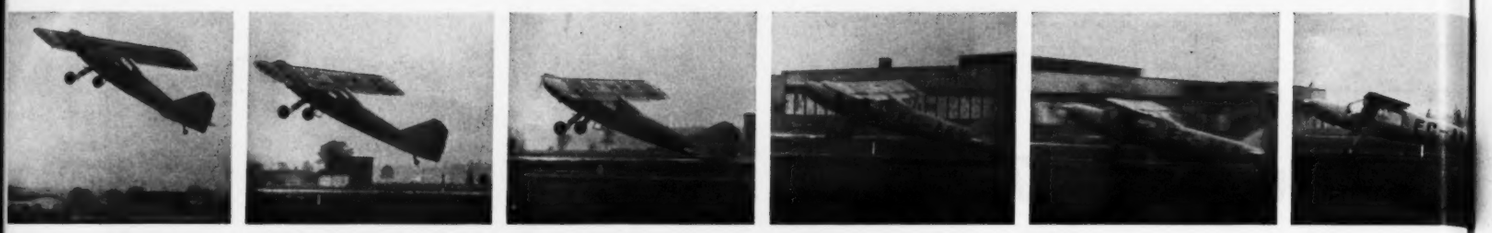
Powerplant installation with engine cowling open.

Landing flaps and ailerons are of double slotted design and fabric-covered. As the flaps swivel about a fixed axis within the airfoil, their operation is particularly simple compared with other complicated flap systems. Ailerons are statically and dynamically balanced.

Fuselage : Two structural peculiarities characterize the all-metal construction of the fuselage : monocoque construction for the end of the fuselage and open bulkhead-and-longeron construction, with four longerons, for the fuselage centre portion, to permit of extra large openings in the side walls. On either side of the fuselage is a large jettisonable door, opening upwards, for the crew, and broad transparent doors for the freight hold. The glass doors, together with a plexiglas hood on top of the fuselage and a window in the upper surface of the wing (behind the box spar) ensure optimum visibility in all directions for crew and other occupants. The freight hold has a useful volume of roughly 88 cu.ft. (2.5 m^3) and a loading aperture 3 ft. 6 ins. by 2 ft. 8 ins. (1,070 by 800 mm).

Tail unit : Tailplane and fin are metal-covered all-metal constructions. The control surfaces, on the other hand, are fabric-covered and both aerodynamically and mass balanced. The tailplane, which can be adjusted in flight from the pilot's seat, can be assembled and removed without previously dismantling the fin.

Controls : Normal single controls, with all control surfaces actuated via cables and rods. Conversion to dual controls, however, is simple



Take-off on a concrete runway : Weight 2,490 lbs.; full power at 2,550 r.p.m.; altitude 1,770 ft.; ambient temperature + 10.5°C; flap setting 23°; cooling valves shut; unstick at 73.5 ft./sec; taxi run 334 ft.; distance to clear 50-ft. obstruction 577 ft.; picture sequence 0.5 sec.

Main dimensions of the aircraft

	Overall length	9.55 m (31′ 4″)
	Span	12.00 m (39′ 4″)
	Overall height (with propeller turning, tail-wheel on ground)	3.50 m (11′ 6″)

Main dimensions of components

Wing unit :	Span	12.00 m (39′ 4″)
	Wing chord	1.65 m (5′ 5″)
	Wing area	19.40 m² (208 sq.ft.)
	Aspect ratio	7.42
Fuselage :	Max. internal height	1.4 m (4′ 7″)
	Max. internal width	1.3 m (4′ 3″)
	Length of cabin, incl. cockpit	3.5 m (11′ 6″)
Control surfaces :	Tailplane area	4.00 m² (43 sq.ft.)
	Rudder unit area	2.56 m² (27.5 sq.ft.)
	Aileron area	2.65 m² (28.5 sq.ft.)
	Flap area	3.60 m² (38.7 sq.ft.)
Landing gear :	Wheel dimensions	530 × 216 mm (21″ × 8.5″)
	Undercarriage track	2.29 m (7′ 6″)
	Tailwheel	200 × 60 mm (8″ × 2.4″)

Engine, propeller and fuel system data

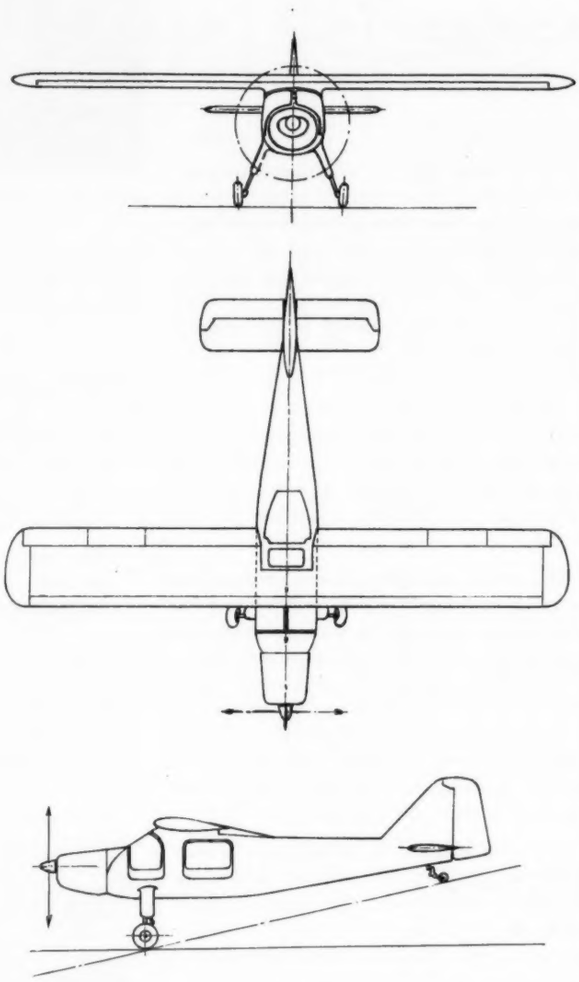
Engine :	Lycoming GO-480-B1.A6	270 h.p.
	Max. sea level rating	270 h.p.
	at	3,400 r.p.m.
	Fuel consumption at cruising output (168 h.p.)	226 gr/hph (0.5 lbs./hph)
	Oil consumption at cruising output	6.5 gr/hph (0.014 lbs./hph)
	Dry weight, incl. oil radiator, starter, generator and propeller regulator	229 kg (505 lbs.)
Propeller :	Hartzell two-blade (metal); diameter 2.48 m (8′) hydraulic constant speed regulation in flight.	
Fuel system :	2 light metal tanks, capacity 105 litres (23 Imp. gals.) each, in the rear portion of the wing, left and right of the fuselage. Over-wing fuelling from the rear.	
	Total fuel capacity 210 litres (46 Imp. gals).	

Weights and performance

Weights : For the fully-equipped aircraft, but excluding radio equipment or dual controls.

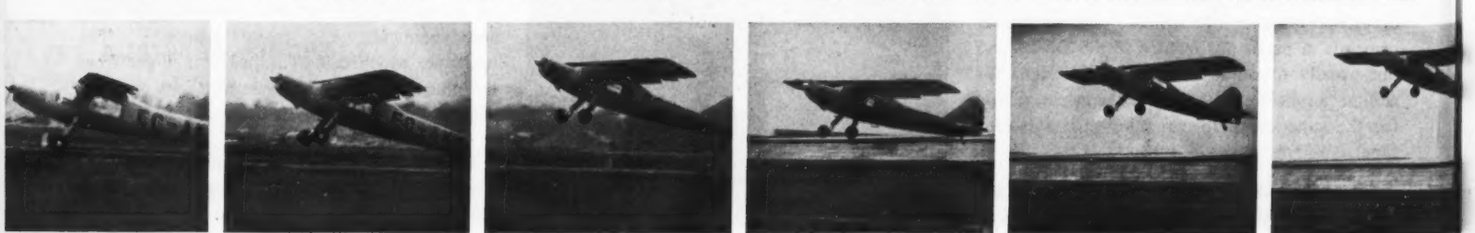
Max. gross weight of the Do 27 is 1,600 kg (3,530 lbs.). The lower the take-off weight the better the short take-off qualities. The following table of weights and performance has therefore been based on a gross weight of both 1,600 kg and 1,500 kg (3,300 lbs.).

	Gross weight 1,500 kg	1,600 kg
Weight empty (four-seat civil version)	985 kg (2,170 lbs.)	985 kg (2,170 lbs.)
Useful load	515 kg (1,135 lbs.)	615 kg (1,355 lbs.)
Fuel	158 kg (348 lbs.)	158 kg (348 lbs.)
Oil	6 kg (13 lbs.)	6 kg (13 lbs.)
Pilot	75 kg (165 lbs.)	75 kg (165 lbs.)
Payload to make up max. gross weight, incl. radio equipment	276 kg (608 lbs.)	376 kg (826 lbs.)
Performance :	Gross weight 1,500 kg still air	Gross weight 1,600 kg still air
Take-off run, at sea level	88 m (290 ft.)	114 m (375 ft.)
Take-off distance to 15 m (50 ft.), at sea level	165 m (540 ft.)	196 m (645 ft.)
Landing run (all at sea level)	75 m (265 ft.)	80 m (260 ft.)
Max. speed at 3,280 ft.	135 knots	134 knots
Cruising speed (60 % power)	111 knots	109 knots
Stalling speed in level flight	30.8 knots	31.4 knots
Climb to 1,000 m (3,280 ft.) in	2.6 mins	3.6 mins
3,000 m (9,840 ft.) in	12 mins	13.5 mins
Ceiling	5,500 m (18,000 ft.)	5,000 m (16,400 ft.)
Fuel consumption in cruise at 60 % power.	36.7 kg/h (80.8 lbs./h)	36.7 kg/h
Range in cruising flight	470 naut. miles	425 naut. miles
Range with extra tanks	—	710 naut. miles



Gen ral arrangement drawing of the Do 27.

Landing on a concrete runway : Weight 2,490 lbs.; altitude 1,770 ft.; ambient temperature + 10.5°C; flap setting 45°; total distance from 50-ft. obstruction 390 ft.; picture sequence 1 sec.



and rapid. Control column and pedals for the right-hand seat are supplied in kit form with the aircraft. — Between the two front seats is the hand wheel for tailplane setting, while the lever for flap operation is fitted in the centre in front of the two seats. The flaps can be deflected via a number of intermediate settings to 60°.

Undercarriage and tailwheel group : The main undercarriage consists of two cantilever single legs, with oleo-pneumatic shock absorbers, the whole with streamline covering. Wheel brakes are operated hydraulically. For winter use, the normal undercarriage can be replaced by skis or a wheel-and-ski combination.

The tailwheel group comprises a solid rubber wheel, steerable through 360°, with sprung leg and automatic return to central position, plus a towing lug. A skid is provided for winter use.

Powerplant : The Lycoming engine is elastically mounted on two beams attached to the firewall. The engine cowling is divided horizontally into two halves opening upwards and downwards to render the engine installation easily accessible. Cooling air for the cylinders enters from the front of the engine and exhausts from the cowling. Its flow is regulated by a hand-operated vane. In addition warm air from the engine nacelle can be passed direct to the carburettor (for pre-heating purposes).

The exhaust system has two manifolds, left and right of the fuselage, arranged in such a way that exhaust gases do not hamper photographic activities. Exhaust heat is used for cabin heating.

An aluminium fuel tank (capacity 23 Imp. gals. = 105 litres) is carried in the rear portion of each wing on either side of the fuselage. — Hartzell two-blade v.p. propeller with constant speed regulation and metal blades.

Cabin heating and ventilation : A two-way switch system enables either warm or cold air to be fed into the cabin at will. Warm or cold air can also be blown over the windows to prevent misting.

*

Applications : The Do 27 is suitable for either civil or military use and is built in the following versions :

Civil applications :

— for touring or feeder services (up to 5 seats)

— for ambulance and rescue duties (two stretchers) ;

— for glider towing ;

— for agricultural and forestry work and for aerial photography.

Military applications :

— for reconnaissance with serial camera (crew of two) ;

— for reconnaissance with hand camera (crew of two to three) ;

— for ambulance service (pilot, attendant, one or two stretchers) ;

— for communications duties (transport of four persons).

The basic equipment for all four military applications can be carried at all times, if desired, so that any duties can be performed without major modifications.

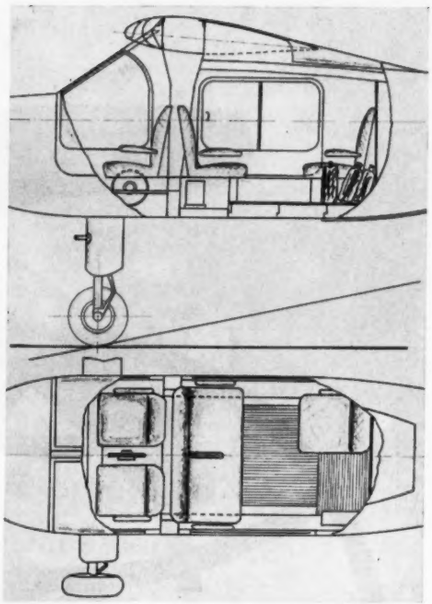
*

Equipment : Flight, navigation and engine instruments in the civil versions are for the most part pneumatic. The military versions, however, use a number of electrical indicators, which can also be fitted in the civil versions if required.

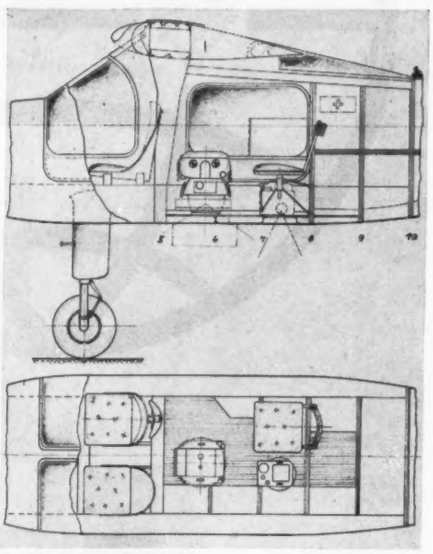
The electrical system is designed for 24 volts and is fed either from a battery (protected) or from a 1.5 kW generator. Radio equipment ils supplied to meet customers' requirements.

Safety equipment includes shoulder and belt harness, fire extinguisher with accessories, first-aid kit and signalling equipment (flare pistol and two boxes of flare ammunition of five rounds each).

Cabin equipment comprises an upholstered pilot's seat (permanent equipment) and a second pilot's seat and up to three other seats, as required.



Five-seat civil version of the Do 27 for touring and feeder services.



Aerial photography version.

The Do 27's fixed leading edge slat (shown here at the fuselage end) runs over the whole span and is built in several parts.

The double slotted landing flap in closed position.

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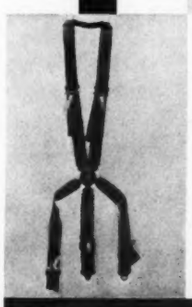
▶ Back-type parachute with flexible cover and adjustable harness.

Quick-fastening and unfastening buckle. ▶

▶ Chrono-barometric release for the automatic opening ot all types of parachute.

Parachute with automatic opening for airborne troops. Experience of this parachute in service has been unequalled. ▼

▶ Quick-release tie-down equipment for all packages.



◀ Pilot harness.

▶ Standard supply bags for all types of new or modified wings.

▶ Missile recovery parachute.

ÉTUDES ET FABRICATIONS AÉRONAUTIQUES

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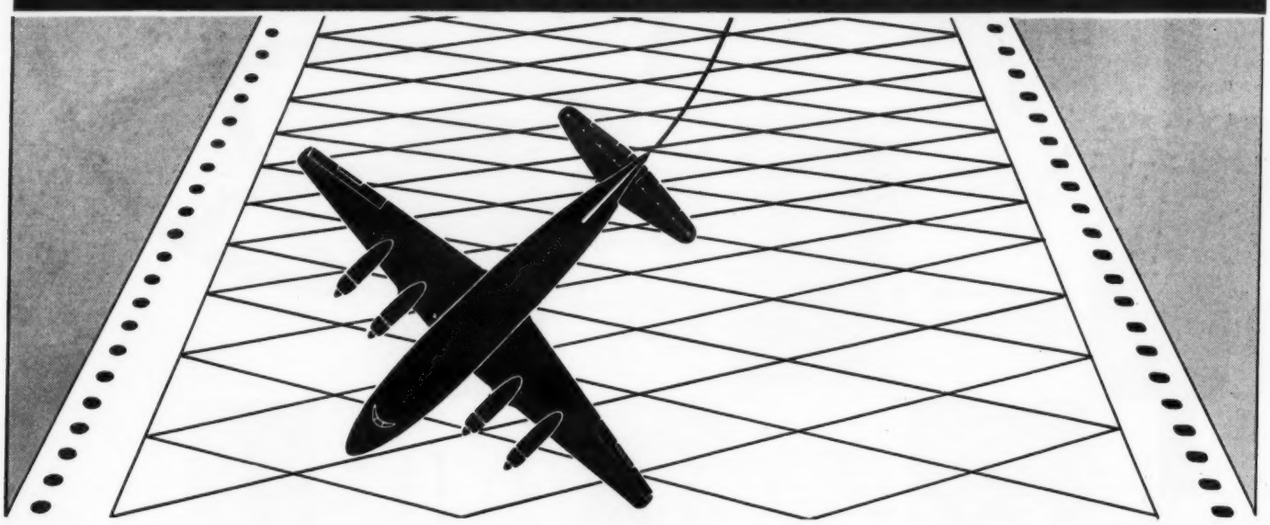
Situation under control



The Decca System is fast becoming an integral part of the entire field of aviation. The Traffic Controller in particular has his task immeasurably lightened when Decca fitted aircraft fly on pre-determined tracks, and their pilots are able to follow instructions precisely. For the first time he can integrate aircraft of all types —fixed wing or rotary, turbo-prop or jet, into a single air traffic control plan. Decca fitted aircraft navigating accurately with reduced separation standards enable him to make the greatest use of the limited controlled air space. He can do so because Decca is the only system accurate enough to ensure that aircraft *can* fly on track, on schedule, at all altitudes, in all weathers, over every kind of terrain. Decca tracks and reporting points have been established in the London F.I.R. since July 1956, and are now being introduced at Frankfurt. Now that Dectra, the long range navaid for the North Atlantic, is on the air, the day when all the air routes of the world will be Decca flown comes nearer. Then indeed the situation will be under control.

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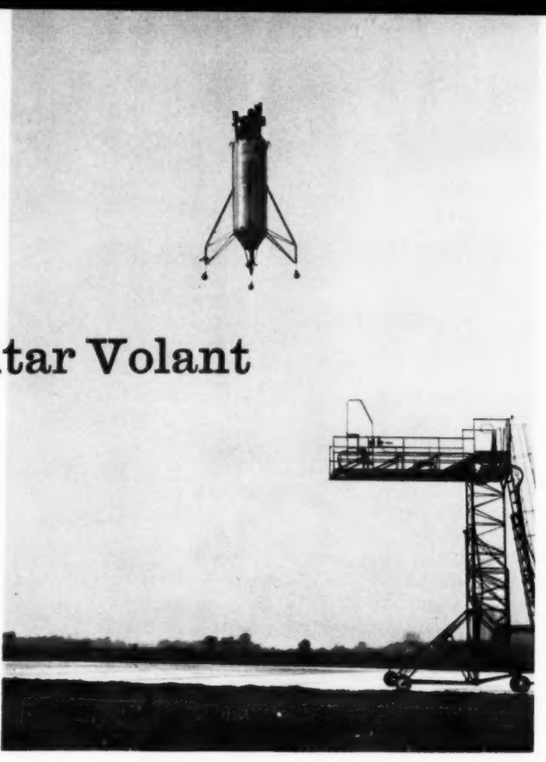


Flying the Atar Volant

By Auguste Morel, Pilot of the C. 400 P. 2

A palpable tremor ran through the huge crowd at Le Bourget when the Atar Volant's great cylinder was seen to rise straight into the air, with a characteristic roar, from amidst a cloud of yellow dust. For the first time, a pure "heavier-than-air", without wings or visible controls, took off, manoeuvred and landed in full public view... a new era had opened in aviation.

Seated at the top of his "chimney" some 300 ft. above the ground, Pilot Auguste Morel – 36, married and the father of two children – steered his strange machine with complete confidence. What seemed something of a miracle to the 200,000 spectators was no more than a routine flight, like so many others, to Morel, a former Navy flyer who has been a test pilot for the past ten years.

When he had landed, amidst the acclamations of the crowd, a sceptic was heard to remark: "All very nice, but what is it good for?"

...The same question, no doubt, as greeted Clément Ader or the Wright Brothers!

*

Auguste Morel, the only man who has flown the Atar Volant, has been good enough to write the following special article for Interavia. *Editors.*

While the flow of air around an airframe is a highly complicated process—in particular in the transonic range—flow conditions inside a jet engine are still more complex. And in the region of the engine air intakes and cooling air slots the two types of flow—external and internal—meet, so that double problems arise here. Again, in the design of the jet pipe end and the rear fuselage, the interaction of external flow and flow through the engine plays a decisive part.

The effort to combine external and internal aerodynamics into a harmonious whole has in the past led to some interesting technical solutions, such as utilization of the cooling air in the engine nacelles to increase propulsion, jet controls in the V2, etc. It was within the framework of such experiments that in 1953 I tried out a *Vampire V* jet fighter equipped with a jet deflection device.

It was also about this time that interest began to be shown in annular wing aircraft for vertical take-off. Though the experimental vehicle was then distinctly primitive, the experiments with jet deflection had proved that a flying machine could be controlled solely by deflecting the engine jet stream. One of SNECMA's test devices consisted of a vertical test bed for jet engines, on which the engine under investigation could make the same odd movements as a radar scanner.

In July 1955, finally, I received instructions to keep a pilot's eye on the development of the *Atar Volant*. It was therefore not without preparation that I ultimately found myself on top of a 26-ft. cylinder, and it is difficult for me to describe my impressions on my first contact with the P.2, since I had watched it grow!

Chief Engineer Eggers fully understood the psychological problems which would face the pilot, and was content that I should become acquainted with my new mount inch by inch, until I felt complete master of it from my elevated saddle.

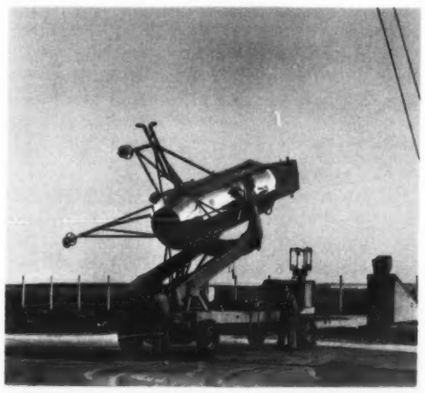
Experiments had previously been made with the P.1 model, under the guidance of Lucien Servanty. Initial tests on SNECMA's gyroscopic test bench were followed by tied-down tests in a special rig (see picture). For the latter tests the machine was attached to the rig by five cables running over pulleys in such a way as to restrict the flying engine's area of movement.

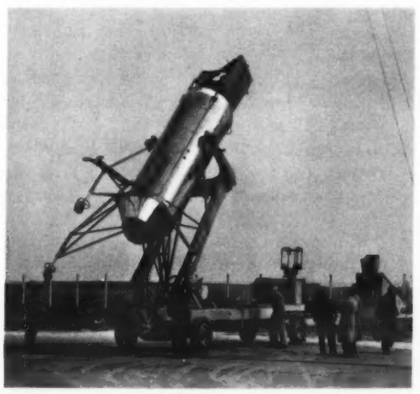
From November 1955 onwards I took an active part in these tests, first taking over control of the P.1 from the remote control desk. The main object of this phase of the experiments was to test the stability theory worked out by Engineer G. Ernst and the functioning of the whole control system.

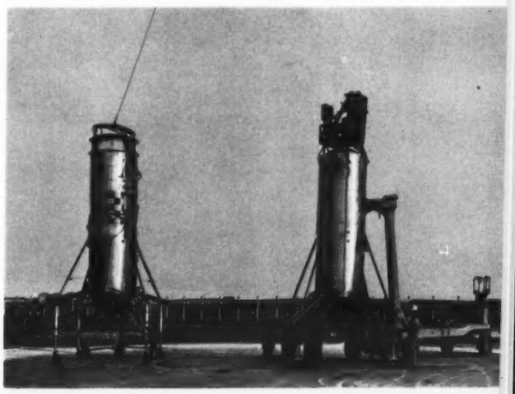
The remote control desk for the P.1 was housed inside a trailer parked about 130 ft. from the vehicle. From his seat the pilot operated a short joystick between his knees, with the aid of which he could vary the vehicle's inclination backwards and forwards, or from side to side (lateral and longitudinal control). At the top of the stick was a knob which steered the P.1 about its vertical axis. The power lever for the jet engine was by the pilot's left hand.

Some 250 remote-controlled tied-down tests in the rig revealed that the vehicle's operating accuracy was greater than that of the remote

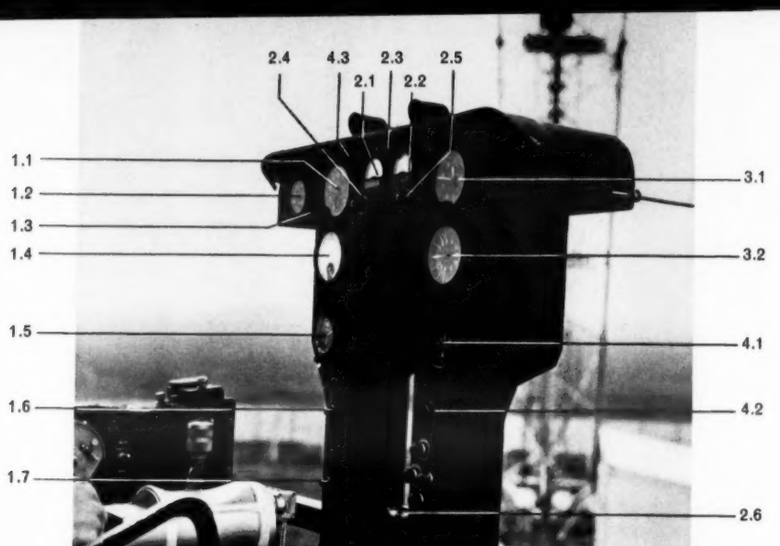
The *Atar Volant P.2*, resting on the cradle of a special vehicle, is raised into the vertical position – in the same way as the V2 – and set up alongside the unmanned *Atar Volant P.1* (on left in right-hand picture).







Auguste Morel climbs into his pilot's seat above the *Atar Volant*'s air intake; left of him the SNCASO ejection seat, right the instrument panel.

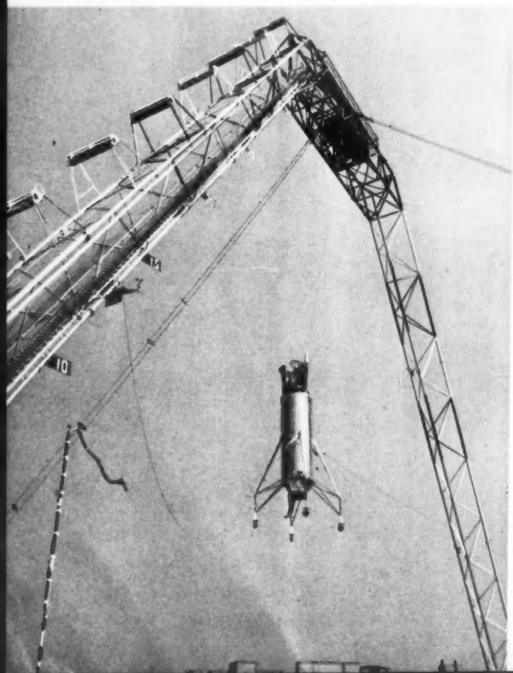


The P.2's instrument panel contains four groups of indicators: 1 – engine instruments (1.1 revs. counter; 1.2 triple indicator for oil pressure, oil temperature and fuel pressure; 1.3 warning lamp for flight exceeding one minute; 1.4 gas temperature in jet pipe; 1.5 chronometer; 1.6 and 1.7 fire warning lamps). 2 – Stabilization instruments (2.1 and 2.2 voltmeters for electromagnetic servos; 2.3, 2.4, 2.5 control lamps; 2.6 inclination indicator). 3 – Flight instruments (3.1 altimeter; 3.2 variometer). 4 – Auxiliary instruments (4.1 amperemeter and 4.2 voltmeter for the overall electrical system; 4.3 check lamp for generator charging). Picture also shows the tiny control column with its knob for control about the vertical axis; far left, the so-called trim box with the base of the power lever.

control system. The most frequent incidents were due to failure of the latter. Other difficulties arose from the play of the control elements in the trailer and the time lag in the pilot's perceptions, both of which caused notable delays in the control system. Hence the accuracy of this method of control was by no means that of a normal autopilot.—The P.1 tests were concluded at the end of February 1957.

During the course of these tests it had already been decided to equip the P.2 with a pilot's seat. The pilot's first problems appeared during a preliminary test on the gyroscopic test bed. Above a certain engine speed high frequency vibrations set up which were very unpleasant for the pilot. Vibration dampers were fitted, however, and the preliminary tests continued.—Another unknown factor at this time was the influence of the pilot's platform on the flow through the engine intake.

Tethered flight by the piloted *Atar* under the rig.



The first tied-down test with full load was made on March 6th, and the P.2 behaved exactly as on the test bench. More than 30 tied-down tests were carried out to make sure that the stabilization system worked reliably. For these flights the P.2 was tethered at two diametrically opposite points of the fuselage and connected to the top of the rig by two cables.

First free flight

The first free flight under the rig took place on March 30th, 1957. The programme was extremely simple: vertical take-off followed by hovering. This flight was undoubtedly one of the most important in the whole *Atar Volant* programme, as it was the first occasion on which many theoretical hypotheses and calculations could be tried out in practice. As soon as the P.2 left the ground, the unpleasant vibrations perceived on the ground disappeared, so that radio communication could be carried out without difficulty. Control raised no problems, and the hovering test was as satisfactory as the subsequent landing. The only task remaining for the next few weeks was to check the stabilization system in all its phases.

Finally, on May 14th, I made the first free flight without rig.—Whereas the pilot of a conventional aircraft can rely on a glide to give him time to think in the event of unforeseen difficulties, the behaviour of the free-flying *Atar Volant* necessitates immediate decisions. The pilot must therefore be fully acquainted in advance with all possible sources of error, so as not to leave his costly vehicle too early (or too late). The high angular accelerations liable to occur in the event of failure of the engine or the stabilizing system require immediate control manoeuvres or... rapid bailing out by means of the ejection seat. But soon I became as familiar with the "cockpit" and instruments as I was with the test engineer's face.

The actual controls in the P.2 resemble those used in the remote-control trailer for the P.1: lateral and longitudinal control is by means of spoilers on the jet pipe exit, which deflect the jet to one side or the other by moving into the gas flow. When the joystick is actuated an electrical current is produced (by potentiometers) and passed to a special relay which integrates the control signal with the output signals from the stabilizing system and then sends a command current to the servo controlling the appropriate spoiler. The stabilizing system incorporates attitude gyros to measure the vehicle's inclination and rate gyros to measure angular velocity. Control about the vertical axis is achieved as follows: the rolling moment exerted on the airframe by the engine is compensated to match each change in rev. speed, by means of compressor air which flows out of four nozzles arranged tangentially on the landing gear.

The mechanics of jet-supported flight

A fundamental point to remember is that the aerodynamic damping of the vehicle is very slight and its drag at low speeds very low. Hence every operation of the controls produces an evenly accelerated or decelerated movement. When the control column is returned to neutral position, the vehicle continues its previous motion with constant speed. To arrest this movement, the *Atar Volant* must be inclined in the opposite direction and left in this position until it stops.

Where movements parallel to the vertical axis are concerned, every engine thrust greater than the vehicle's total weight produces an acceleration along the vertical axis, until the thrust becomes equal to the weight plus drag. Once this condition of equilibrium is achieved, the vehicle continues its flight with constant vertical speed.

A critical point in the vertical control (by means of the power lever) is the maximum per-

missible speed of descent. As the *Atar's* static thrust of approx. 6,380 lbs. is only a little above the gross weight of the entire vehicle (weight empty 4,400 lbs., pilot 220 lbs., fuel weight 1,100 lbs.; total gross weight 5,720 lbs.), the specific thrust (thrust-to-weight ratio) in the P.2 is only slightly above 1. For each different altitude there is, therefore, a maximum speed of descent, determined by the engine's thrust surplus, at which the vehicle can just be brought to a standstill. For example, the maximum permissible rate of descent at an altitude of 26 ft. and for a thrust/weight ratio of 1.1 is 13 ft./sec. As the force of gravity is roughly ten times as high as the vertical acceleration or deceleration obtainable with the *Atar*, great care must be taken when throttling down in preparation for descent (reducing the engine speed). Thus a great deal more attention must be paid to the barometric indicators for vertical speed and altitude than to the air speed indicator in conventional oblique take-off aircraft. The power lever in the *Atar Volant* must be handled during hovering flight with at least as much care as in a jet fighter flying in close formation. Whereas the engine speed range in a jet aircraft varies only slightly between the beginning and the end of a formation flight—the improvement in L/D ratio as gross weight diminishes can be compensated by slight reductions in thrust—the required engine speed in the wingless P.2 is directly dependent on the fuel weight.

The pilot's cockpit contains a SNCASO ejection seat, which can carry the pilot to safety from an altitude of as little as 50 ft. when the P.2 is in the vertical position; for a 45° inclination a minimum ejection altitude of 80 ft. is required. The altitude range between 26 ft. and 50 ft. can be compared roughly to the critical autorotation altitude in helicopters and must be passed through as rapidly as possible. Allowance must also be made for the fact that the thrust component acting against the vehicle's weight in the vertical becomes progressively smaller as inclination increases. It can therefore happen that the *Atar Volant* will sink to the ground from a marked oblique position even at full thrust. Excessive inclinations must therefore be corrected without delay.

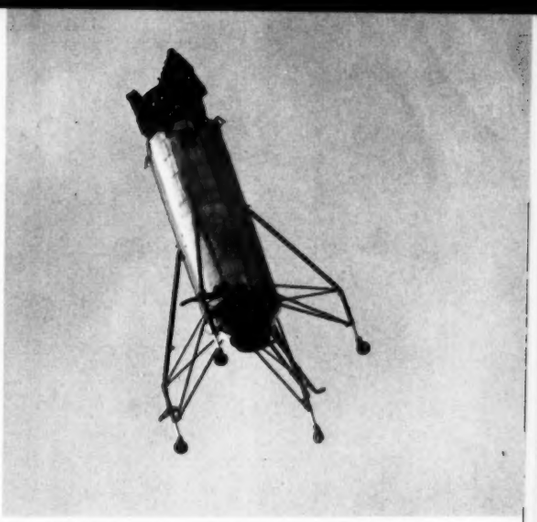
Steering the P. 2

The *Atar Volant* can be navigated with sufficient accuracy by reference to ground landmarks. However, the cockpit is equipped with enough instruments to make it unnecessary for the pilot to watch the ground the whole time, so that he is not permanently conscious of his altitude. Neither engine noise nor other disturbances hamper him in the exercise of his duties. Piloting the P.2 requires no particular tricks, and hovering can be maintained "hands off". Take-off presents no problems; apart from opening the power lever, nothing need be done until the vehicle has comfortably left the ground. During landing care must be taken to keep rate of descent low. Horizontal movements are set off by inclining the vehicle in the desired direction.—The greatest altitude so far reached is roughly 650 ft., a figure determined primarily by the fuel capacity.

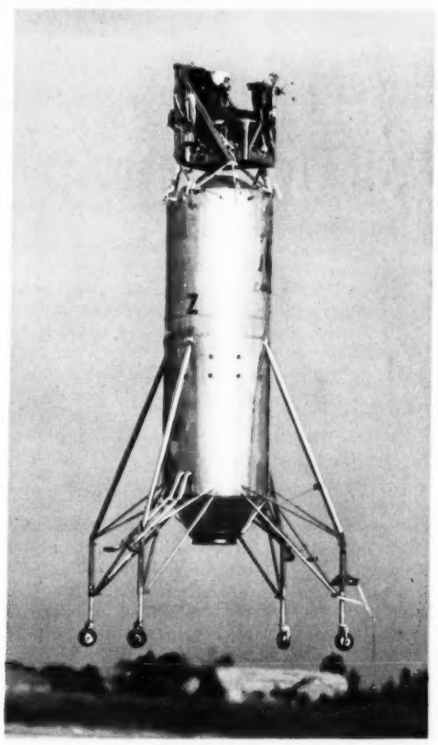
The *Atar Volant* is practically insensitive to wind and has been tested in winds of up to 50 ft./sec. Wind gusts are naturally felt immediately, but do not necessitate action by the pilot. Every landing since the beginning of the free flight tests has been within a circle 33 ft. in diameter without any special effort being made to achieve this precision.

Future prospects

In conclusion it can be said that the *Atar Volant* is fully controllable at all speeds, including zero. Admittedly it requires a relatively high specific thrust, but this also applies to today's interceptors. Here too we find thrusts approaching the aircraft's weight or even exceeding it. Whereas, however, the aerodynamic control surfaces in conventional aircraft are by no means entirely satisfactory at the Mach numbers demanded today, the jet control system in the *Atar Volant* should meet requirements much more successfully. The problems arising in the take-off and landing of conventional aircraft (e. g., bad visibility from delta-wing aircraft during landing; long take-off runs for straight-wing types with high wing loading) can be avoided in jet-controlled and jet-supported vertical take-off aircraft. And the *Atar Volant P.2* is only a first manned experimental vehicle for vertical take-off... other SNECMA vehicles, with annular wings, are to follow.



The cylindrical machine rises from the ground at full power under the sole "control" of the autopilot (bottom) and climbs vertically ... until it reaches a suitable height, when the pilot inclines it and goes over into level "flight" (top).



Atar Volant being refuelled before take-off; right, behind it, a mobile maintenance platform via which the pilot climbs into his seat.

SNECMA Chief Pilot Auguste Morel (left) in conversation with Prime Minister (then Defence Minister) Bourgès-Maunoury (right foreground) and Secretary of State Henry Laforest.

A New Home for the Netherlands Government Civil Flying School

Prince Bernhard of the Netherlands (centre) opening the Rijksluchtvaartschool at Eelde. On his right, Transport and Waterways Minister J. Algera; left, Commandant K. J. A. Meester, head of the School.

By Henk A. Jansen, Interavia's Amsterdam Correspondent

It was a fine day in May when the Fokker *Friendship* took off from Schiphol Airport for Eelde, in the northeast corner of Holland, where a large crowd of Government officials, Netherlands and foreign press representatives and curious spectators was gathered to attend the official inauguration by Prince Bernhard of the Netherlands of the new premises erected for the Government Civil Flying School (Rijksluchtvaartschool).

Our short flight of only 20 minutes over the grey surface of the former Zuider Zee had something of a symbolic nature. The *Friendship* —ours was the second prototype, which has already logged more than 100 flying hours—is one of K.L.M.'s aircraft of the future and was on its way to land for the first time at the base where crews are being trained to man the K.L.M. fleet in the years to come. Beneath us lay the stretch of water which is gradually being turned into dry land and which promises a larger and more prosperous Netherlands. Thus both on the ground and in the air the Dutch are working for the future.

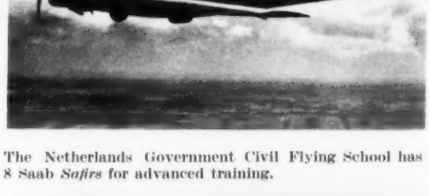
One of the main reasons for transferring the Rijksluchtvaartschool to new buildings at Eelde aerodrome, near Groningen, was to escape the military flying which had previously hampered training at Ypenburg. Here in the new centre, which is unique in the world, students receive theoretical instruction in navigation, radio communications and general aeronautical theory, before going on to flying training proper.

The idea of a separate training centre for civil airline pilots—originally civil pilots were recruited from the Air Force—goes back to 1931, when the Netherlands Government decided to establish a national centre for the purpose. Not that the Rijksluchtvaartschool then came into being in its present form. In fact at that time, future civil pilots, selected by a special committee, first went for theoretical training to the Merchant Navy Officers' school, where the course of instruction was supplemented for their benefit by special lectures on aviation subjects.

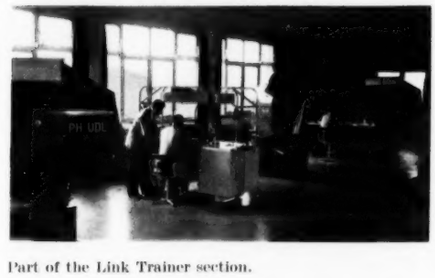
Elementary flying training was then given by the N. V. Nationale Luchtvaartschool, a private flying school still in existence today. And final training was completed by K.L.M. itself.

The Netherlands Government Civil Flying School has 8 Saab *Safirs* for advanced training.

Part of the Link Trainer section.



A radio-telephony class.



The engine specialists.

Residential wing of the Rijksluchtvaartschool, Eelde.

A perfect three-point landing.

The expansion of air transport after World War II and the increasingly high standards demanded of airline pilots necessitated a new, completely independent training programme. The Netherlands Government Civil Flying School was thus founded, under the leadership of the late K.L.M. President Dr. Albert Plesman. The first course, attended by 78 students, opened on April 8th, 1946. Up to the present time the School has trained 356 airline pilots, of whom 336 have entered K.L.M. service. The remainder, most of them foreign students, have been trained for Garuda Indonesian Airways, Airaustria and other companies. Though training is not designed solely to meet K.L.M. needs, the national carrier's growing demand for aircrew necessarily restricts the number of foreign students that can be accepted.

Students wishing to train as commercial pilots at the Rijksluuchtvaartschool must have completed high school education and show physical and mental aptitude for flying. The course of theoretical and practical training lasts roughly 2½ years, during which time a total of at least 302 flying hours is completed. This total breaks down as follows: 48 hours general dual control, 67 hours general solo, 70 hours instrument flying, 30 hours navigation dual control, 70 hours navigation solo, 9 hours night flying dual control, and 8 hours night flying solo. After the flight programme has been covered and at least 1,400 hours have been devoted to theory—all of which takes about two years—the student takes his theoretical examinations for the Senior Commercial Pilot Licence and Airline Pilot Licence. The remainder of the course is given over to theoretical navigator training, which is completed after pilots are in service with K.L.M. At the end of 2½ years, students take the practical examination for the Commercial Pilot Licence, which then entitles them to pilot twin-engine aircraft up to a weight of 12,500 lbs. and to act as co-pilot of heavier commercial aircraft.

During our visit to Eelde we had the opportunity of thoroughly inspecting the whole training base, which is headed by Commandant K. J. A. Meester and can accommodate 120 students. We admired the fine, modern school buildings, the classrooms, the light, gay living quarters, the recreation building with refreshment bar, dining and reading rooms, kitchens and washrooms. We also visited the hangars, the workshops, the stores, the Link Trainer section and the gymnasium. We were shown the fleet of 62 aircraft, consisting of 23 *Tiger Moths*, one Fokker S-11, eight Saab *Safirs*, 18 NorthAmerican *Harvards* and 12 Beechcraft D-18s. This relatively old fleet is shortly to be replaced by aircraft of the latest designs.

We came away with the firm impression that the training of Holland's future airline pilots is in very good hands.

The Rijksluchvaartschool's insignia.

Royal Netherlands Aero Club's 50th Anniversary and Ypenburg International Air Display

By H. A. Somberg, Amsterdam

Her Majesty Queen Juliana and suite smiling despite the rain at the 6th Ypenburg International Air Display.

This year's Ypenburg International Air Display—the 6th I.L.S.Y.—held on Whit Monday, June 10th, 1957 simultaneously celebrated the Royal Netherlands Aero Club's 50th anniversary.

Although it was only a week since the Paris Air Show—so that many of the international spectators at any right might have been expected to be somewhat *blasé*—and despite the rain which forced Her Majesty Queen Juliana to take refuge under an umbrella during part of the display, the organizers must be congratulated with having put on an extremely interesting show. After all, the Dutch have overcome greater obstacles than these in the course of their history! And the several hundred thousand spectators who flocked to Ypenburg were not to be robbed of their enjoyment by a little matter like bad weather.

The organizers had cleverly divided the programme into a number of "chapters" each illustrating a different phase of aviation, which undoubtedly contributed to the success of the display and, incidentally, simplified the task of reporting on the various events.

Immediately after the arrival of the Queen and her suite, the pageant was opened by a parade of Army Piper *Super Cubs* towing the flags of the participating N.A.T.O. countries.

Next came the "*History of Aviation*", with balloon ascents and a veterans parade: the Danish Ellehammer (1906), Blériot XI (1909) and Fokker *Spider* (1911). The 28-year-old Fokker F.VII airliner formed a link between these good-natured early crates and the faster, noisier designs of today.

"*Crop-Spraying*": Piper *Super Cubs*, Edgar Percival EP.9, Auster *Agricola* and the SO.1221 *Djinn* helicopter mercilessly attacked imaginary pests in front of the enclosures with clouds of brown smoke and spray.

"*Soaring*": An attractive, silent entr'acte, with a collection of graceful sailplanes searching in vain for thermal currents, concluded by a masterly demonstration of inverted flying by a *Rhönlerche*.

"*Pilot Training*": Parade of the trainers used by the Royal Netherlands Air Force and the Government Civil Flying School (*Tiger Moth*, Fokker S.11 *Instructor*, *Harvard*, Beechcraft, Fokker S.14 *Mach-Trainer*), supplemented by a visiting Hunting Percival *Jet Provost*.

Any lengthy description of the "*Military Aerobatics*" chapter would be a little out of place in this Paris Air Show issue. Inevitably the Ypenburg demonstrations closely resembled the displays seen in Paris—several of the acrobatic teams had, of course, come virtually straight from Le Bourget. The latter included the U.S.A.F. "Skyblazers", whose elegance and precision had in no way diminished, and the "Patrouille de France" on Dassault *Mystères*, which also won ungrudging admiration from the Dutch.

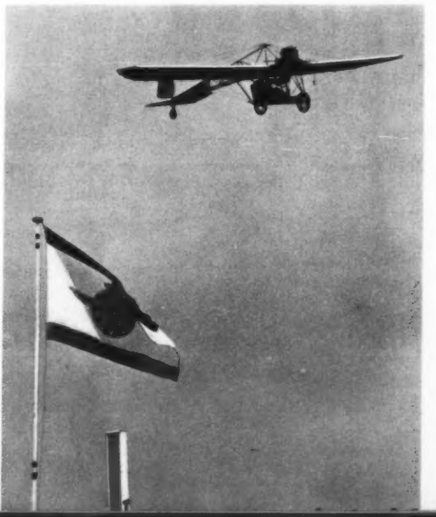
However, the Ypenburg programme offered a number of exclusive items, among them the following:

"*Symphony of Air and Water*": Netherlands and British naval aircraft jointly demonstrated patrolling, spotting and killing of a "shore-based" submarine, which "blew up" convincingly (by remote control) after fierce attacks by Grumman *Avengers*, Fairey *Gannets*, Lockheed *Neptunes*, de Havilland *Sea Venoms* and Hawker *Seahawks*. Whereupon a huge Martin *Mariner* of the Netherlands Naval Air Service obligingly supplied the "survivors" with a dinghy from which they were rescued by a Sikorsky S-55.

Brief mention must also be made of the impressive aerobatic display by the Royal Netherlands Air Force and the Reggia Italiana (on Republic *Thunderstreaks*) and of a collection of German, Finnish and Czech light aircraft grouped together under the "*Pegasus in the Light Cavalry*" chapter. The chapter entitled "*Under the Nylon Canopy*" consisted of parachute jumps by members of the First Netherlands Parachutist Club. Last but not least came the fly-past of "*Commercial Aircraft*": Miles HDM.105, Hunting Percival *President*, Handley Page *Herald*, Douglas DC-7C and Fokker F.27 *Friendship*, the latter demonstrating, as in Paris, its excellent flying qualities on one engine.

At 17.30 the Queen, Princesses and suite boarded two Air Force *Dakotas*, while the organizers—tired, but well pleased with the success of the Jubilee Display—returned to private life.

The 1906 Danish Ellehammer flying over the Royal Netherlands Aero Club's flag.



What's in the Air?

Extracts from Interavia Air Letter, *daily international news digest, in English, French and German. All rights reserved.*

AIR TRANSPORTATION

● **Olympic Airways** has ordered four DC-6Bs and two DC-8s from Douglas Aircraft Co., according to Union Aéromaritime de Transport, who act as general agents for the Greek airline in the French Union, Rhodesia and the Union of South Africa. The DC-6Bs will be delivered in the first quarter of 1958, and the DC-8s during 1960. It is further reported from London that the company is also interested in the purchase of three or four Bristol *Britannias*.

● **Union Aéromaritime de Transport** has ordered three additional *Noratlas 2502* transports from SNCA du Nord, for delivery in late 1957 and early 1958. U.A.T. will then have eight *Noratlas* in service. —The company has specified the Pratt & Whitney JT4A (civil version of the J75) engine for the five Douglas DC-8s it has on order.

● **Three SE.210 Caravelles** are to be purchased by Pacific Southwest Airlines, the U.S. domestic carrier, according to a statement by Company President Kenneth Friedkin. Delivery date, spring 1960. The company at present operates Douglas DC-4s on its network (Los Angeles, San Diego, San Francisco).

● **Swissair's fleet** now comprises 31 aircraft: seven Douglas DC-3s, one *Dakota* used for freight, three DC-4s, 11 Convair *Metropolitans* for short and medium distances, six DC-6Bs and three DC-7Cs for long-distance routes.

● **New Lufthansa Chief Pilot** is Captain Rudolf Mayr, previously head of the Flight Service Department.

● **A roughly 50% increase in landing charges** at British airports came into force on June 3rd.

● **Britain's Ministry of Transport and Civil Aviation** is preparing to spend £ 4,000,000 on an ambitious air traffic control modernization programme. Of the total £ 2,000,000 will be spent on sites, buildings and the acquisition of new land, and the other £ 2,000,000 on new equipment. The three control zones, London, Preston and Prestwick, will have new surveillance radar with cover up to 75 miles, and London will have additional radar providing 125 mile coverage. In addition, calculating machines, electronic computers and memorizers, and message simplification machinery are to be introduced to speed up air traffic control work.

● **Ghana** has been admitted as 71st Member State in the International Civil Aviation Organization.

Colonel Charles Yeager (centre) and Mrs. Yeager during a vacation trip to Geneva. Right, Edouard Koessler, Commercial Manager of Lear S.A. —Colonel Yeager was the first pilot to fly supersonic (Mach 1.06), on October 14th, 1947 aboard a Bell X-1 experimental aircraft. On December 12th, 1953 he reached Mach 2.5 in the Bell X-1A. He is now serving with the U.S. Air Force in France.

● **The U.S. Civil Aeronautics Board** has refused to sanction the 5% increase in North Atlantic fares proposed by the International Air Transport Association.

● **Fédération Internationale des Journalistes Professionnels de l'Aéronautique** (International Federation of Aviation Writers) is the name of a new association founded in Paris. Members include aviation writers from Belgium, France, Germany, Holland, Italy, Spain, Switzerland, etc. The Committee consists of Georges Février (President of the French Aviation Writers Association and *Interavia* Manager for France), Chairman; Raffaelo Guzman (President of the Italian Aviation Writers Association), Hubert Zuerls (of the German Luftfahrtpresse-Klub) and Saenz de Pazos (Spanish aviation journalist and *Interavia* correspondent), Vice-Chairmen; Secretary Dutertre, France. Provisional headquarters of the association are at 144, Avenue des Champs-Elysées, Paris (Interavia France offices).

Inauguration of the $ 20,000,000 assembly buildings for the Douglas DC-8 at Long Beach, California. Top: President Donald W. Douglas receives a Distinguished Service Citation from J. Badenhausen, President of the Long Beach Chamber of Commerce. Bottom: the new dual building covers a floor space of approximately 1,000,000 sq. ft.

INDUSTRY

● **A Government subsidy** to boost French aviation exports is provided for in a bill published by the *Centre National d'Expansion de l'Industrie Aéronautique Française*, under which the State will guarantee a proportion of each loan obtained by the industry from the Banque Française du Commerce Extérieur to finance stocks for exports. This proportion will be up to 15% of each production batch. If no foreign customers are found for a production batch, the equipment will be taken over as far as possible by the French armed forces. For the remaining equipment, the State will be responsible for repaying up to 15% of the bank loans.

● **French aircraft industry exports** in 1956 amounted to more than 300 aircraft. Present order backlog with the French industry is valued at 28,000,000,000 francs The value of aeronautical equipment actually exported during 1956 (in thousands of francs) is as follows: airframes and airframe parts 4,471,765; piston engines 934,607; jet engines 846,760; accessories and ground equipment 761,503. Total 7,014,635,000

The West German Federal Armed Forces have ordered fifty Bristol *Sycamore* helicopters for ambulance, sea rescue and transport duties. The first two *Sycamores* were recently ferried from Weston to West Germany.

Lockheed T2V-1 *SeaStar* carrier-borne jet trainer (left) which is to go into service with the U.S. Navy this summer. Right, the two-seat version of the Lockheed F-104 B *Starfighter* supersonic fighter.

Snapshots of the aircraft carrier U.S.S. *Franklin D. Roosevelt*: left, a Chance Vought F8U-1 *Crusader* is prepared for catapult take-off. Right, a *Crusader* landing by means of the mirror landing system. Mirror and reference lights are seen in the centre of the picture.

Lawrence A. Hyland, Vice-President and General Manager of Hughes Aircraft Company (left), has been granted the Pioneer Award of the Institute of Radio Engineers in appreciation of his services in the development of radar equipment. Right, Brigadier General P. C. Sandretto, of IRE.

James N. Davis has succeeded Lawrence E. Williams as assistant to Don R. Berlin, President of Vertol Aircraft Corp.

Two of *Interavia's* staff have made supersonic flights: *left*, Harry Tennant, Editorial Director, U.S.A., Washington, beside the Grumman F9F-8T with Grumman Test Pilot William Cochran; *right*, Derek H. Wood, London Director, in a Hawker *Hunter T.7* with Hawker Chief Test Pilot "Bill" Bedford (far right).

francs, compared with 5,121,501,000 francs in 1955.

● **Armstrong Whitworth Aircraft Ltd.** is building components for the Scottish Aviation *Twin Pioneer* and may eventually build the complete aircraft at Coventry in addition to the Scottish Aviation line at Prestwick.

● **Chance Vought Aircraft Inc.** has received a $ 5,000,000 contract for continued development of a new carrier-based fighter for the U.S. Navy.

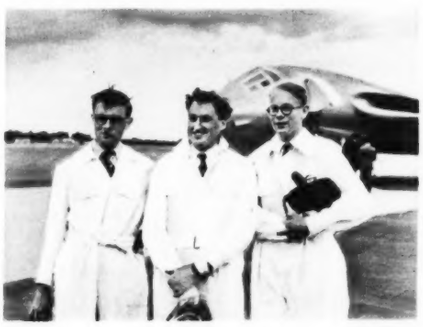
● **Lockheed Aircraft Corp.** has been awarded a $ 4,500,000 contract by the U.S. Air Force to continue a research programme with the X-7 supersonic ramjet missile.

● **An Aero Commander 560-E** twin-engine aircraft has set a new world record for long-distance, non-stop flight by flying 1,522 miles from Guatemala City to Oklahoma City. The previous record for this class of aircraft (3,858 to 6,613 lbs.) was 1,235 miles and was set by a Russian single-engine fighter. Elapsed time on the Aero Commander flight was 8 hours and 5 minutes, average speed 190 m.p.h., and 197 gallons of fuel was used out of 223 gallons carried.

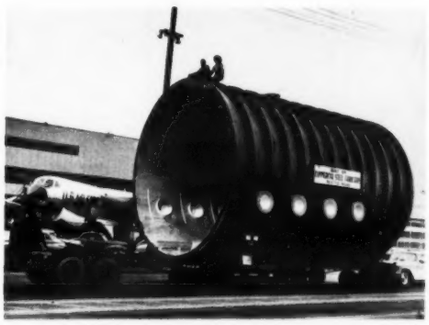
● **The Fuji T1F1 jet trainer** developed by Fuji Heavy Industries for the Japanese Defence Agency will be built by the following companies: Shin Mitsubishi (tail units), Kawasaki Aircraft (rear fuselage), Shin Meiwa Industry (fuselage fuel tanks) and Yokohama Rubber Co. (wing fuel tanks). The first T1F1 is scheduled for delivery in October this year.

● **Aeronautical scientists** from eight countries have decided to organize an International Congress of Aeronautical Sciences. The first session will be held in the late summer of 1958. A provisional council has been elected with Professor Theodore von Kármán as Honorary President. The executive committee is headed by Maurice Roy, Member of the French Academy of Sciences and Director General of O.N.E.R.A.

● **Schweizerische Vereinigung für Flugwissenschaften** (Swiss Association for the Aeronautical Sciences) is the name of a new organization founded recently in Zurich for the purpose of promoting aeronautical research. Head of the group is Professor M. Rauscher, of the Federal Institute of Technology, Zurich.



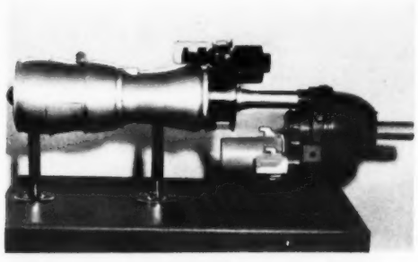
A Handley Page *Victor B.1* jet bomber (bottom) has reached a speed corresponding to Mach 1.1 in a shallow dive. The crew (top) comprised Flight Lieutenant J. W. Allam, pilot (centre) and two observers, G. Wass (left) and P. Langston (right).

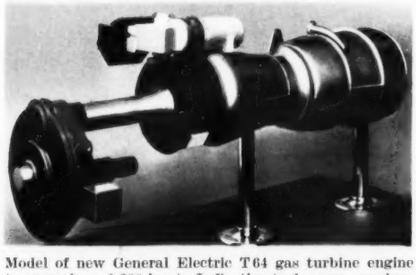


Boeing Airplane Company is installing a test chamber at its Seattle plant which will permit the testing of entire aircraft systems at temperatures ranging from − 65 °C to + 650 °C and simulated altitudes from sea level to 120,000 ft. The steel tank is 19 ft. in diameter and 35 ft. long.

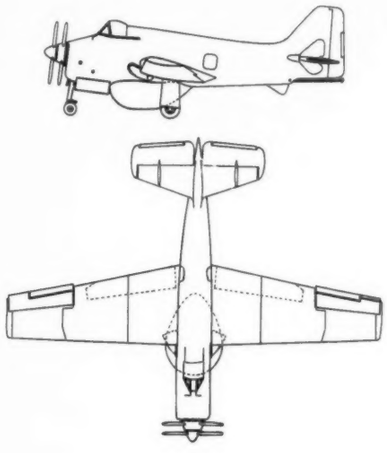
The Saunders-Roe SR.53 experimental interceptor with mixed propulsion (jet plus rocket motor) began flight testing at Boscombe Down in mid-May.

The Republic F-105 B *Thunderchief* with Pratt & Whitney J 75 jet (thrust class 15,000 lbs.), designed as a weapons system, is now in production. Span more than 30 ft., length more than 60 ft.





Model of new General Electric T64 gas turbine engine (power class 2,600 h.p.). Left, the turboprop version; right, the turboshaft model (for helicopters).



Fairey *Gannet A. E. W. 3* radar early warning aircraft, which has been ordered for the Royal Navy.

Back home after a round-the-world flight: three Lockheed *Neptune* anti-submarine aircraft of the Royal Australian Air Force over Sydney.

AIRCRAFT AND POWERPLANT

● *Turboprop developments* in the 900 to 1,100 h.p. range are under consideration by a number of British firms: Alvis have studied one unit, de Havilland is considering a licence for either the T55 or T58, and Armstrong Siddeley are proposing a new engine.—The *Armstrong Siddeley* engine, now under development, is believed to be the P.181. It will be of about 1,000 h.p. with a two-stage centrifugal compressor and a dry weight of 374 lbs. Max. diameter will be only 28 inches, and the engine will be available for both fixed-wing aircraft and helicopters.

● The British firms of A. V. Roe, Short Brothers & Harland, Hunting Percival and de Havilland are showing interest in the development of *25—28 seat feeder-liners,* particularly with various types of STOL gear.

● *Hunting Percival Jet Provost T.3* is the latest trainer for the R.A.F., with ejection seats, fully transparent windscreens, and up-rated *Viper ASV.8*.

● A development of the French SE. *Alouette* turbine-powered helicopter, the SE.3140, has begun flight testing. It is fitted with a 400 h.p. Turboméca *Turmo II*. —*Alouette-Gouverneur* is a luxury version of the *Alouette,* which also recently began flight tests.

● The first prototype of the *Fokker F.27 Friendship* (PH-NIV) has now completed more than 550 flying hours, while the second (PH-NVF) has totalled roughly 100 hours.

● A U.S. Navy contract valued at $ 58,500,000 for the development of a new turbine engine has been awarded to *General Electric Co.* The engine will be known as the T64 and will be adaptable for use as a turboshaft or turboprop powerplant for installation in helicopters, transports and other support aircraft. As a turboprop, it will be able to power propeller-driven and STOL and VTOL aircraft; as a turboshaft engine, it will be suitable for helicopter and convertiplane installation. The T64 will be in the 2,600 h.p. class; power/weight ratio will be more than 3 to 1, and consumption will be exceptionally low.

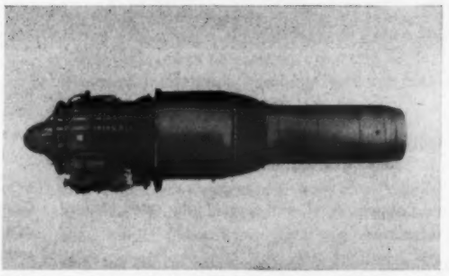
● *Consolidated Helicopters Ltd.,* Vancouver, is a new company formed for the *manufacture of jet-propelled helicopters*. A first helicopter prototype is being manufactured, under the designation *J-6*. It will be powered by three ramjets at the tips of its aluminium rotor blades.

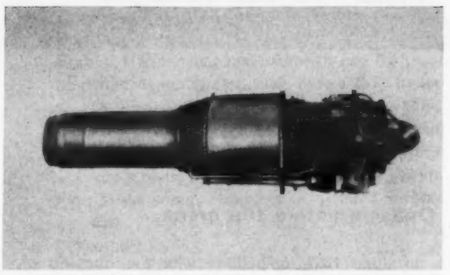
The Bristol Orpheus Turbojet

The development of the Bristol *Orpheus* has been extraordinarily rapid and trouble-free, and official acceptance of the *B.Or.3* version with a rating of 4,850 lbs (2,200 kg), came only two and a half years after the first test bench run in December 1954. In early 1957 Bristol delivered the first units, ordered under the N.A.T.O. Mutual Weapons Development Programme, for installation in the Dassault *Etendard VI*, the Breguet 1001 and Fiat G.91 ground attack aircraft, as well as those for the Folland *Gnat* lightweight fighter, the Fuji T1F-1 jet trainer, and the Hispano H.A.300 interceptor.

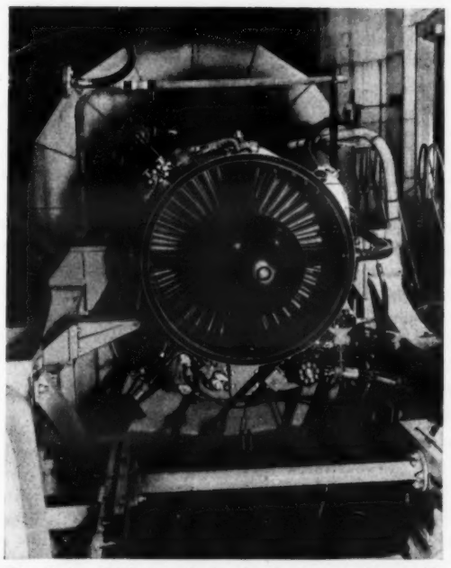
The preliminary data releases show the weight of the *B.Or.3* as 810 lbs (367 kg) which gives a thrust/weight ratio of 5.99 lbs thrust per pound of engine weight (5.99 kp/kg); this is the highest ratio ever recorded for a type-tested engine. The specific fuel consumption is calculated at 1.06 1bs/1bs thrust/per hour (1.06 kg/h/kp.)

In view of the steadily growing demands for increased performance from lightweight fighters, Bristol is further developing the *Orpheus* series in order to get even higher performance out of this engine than was planned for the original design. The recent announcement of the *Orpheus B.Or.11*, rated at 5,760 lbs (2,613 kg) is an indication of the success of this programme and Bristol engineers are at present working on the *B.Or.12* rated at 6,800 lbs (3,090 kg); fitted with an afterburner this engine will have a rating of 7,900 lbs (3,600 kg).



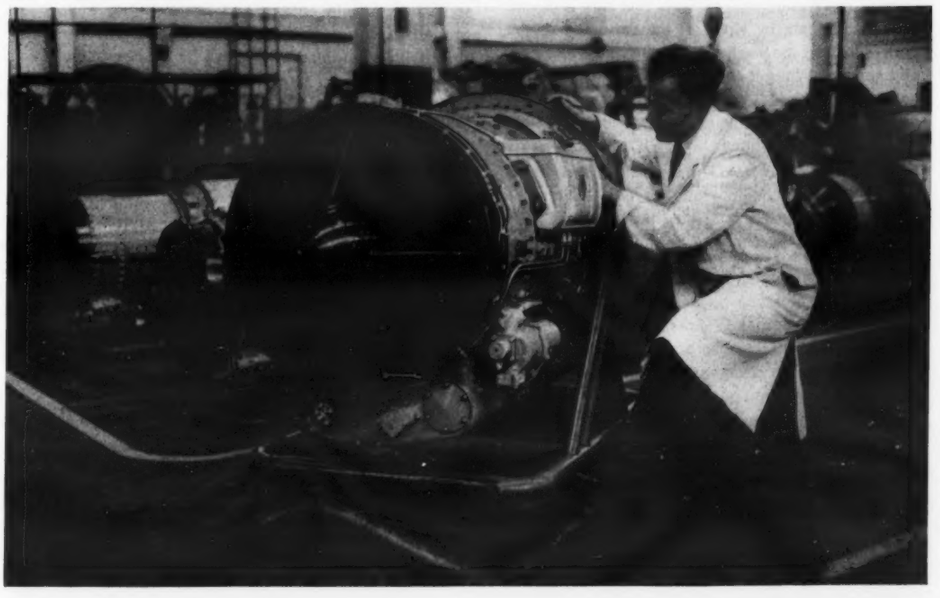


Side views of the *Orpheus B.Or.3: left*, the lefthand side of the engine, showing the fuel filter and, below the compressor, the fuel control unit; *right*, the righthand side, with cartridge starter and Labinal generator.



The *Orpheus B.Or.3* on the bench prior to test; the cartridge starter and oil tank can be seen.

One of the first *Orpheus B.Or.3* turbojet engines now known to have the record thrust/weight ratio of 5.99 lbs (5.99 kp/kg).



Leading particulars of the Bristol Orpheus B.Or.3.

Type:	Lightweight turbojet engine with 7-stage axial compressor, annular combustion chamber with separate flame tubes, and single-stage turbine.
Length:	74.45 ins (1.91 m) intake face to exhaust flange, 96.1 ins (2.44 m) overall.
Diameter:	32.4 ins (0.822 m)
Thrust:	4,850 lbs (2,200 kg)
Thrust/ Weight ratio:	5.99 lbs thrust per pound of engine weight (5.99 kp/kg)
Specific fuel consumption:	1.06 lbs/lbs thrust/per hour (1.06 kg/h/kp)

AIR TRANSPORT FIXES AND HEADINGS

Onassis enters the arena.

In June 1957, coinciding with the opening of **Olympic Airways** European services, **Union Aéromaritime de Transport** sent out invitations, bearing the emblem of the new Greek airline, to a cocktail party in Paris.

A commonplace occurrence? During the Paris Air Show official cocktail parties were part of the daily routine and, after all, U.A.T. is the French

representative of Olympic Airways; in aviation transport circles the acceptance of an agency is an everyday matter and, normally, barely receives mention. But the announcement of the tie-up between Olympic and U.A.T. has, perhaps, a more subtle inference, over and above the usual exchange of booking facilities to reduce mutual office and personnel costs.

For many years the more far-sighted experts have been urging a closer working arrangement between the various European air transport companies, but the repeatedly proven successful methods of equipment exchanges which are common in the U.S.A. seem to run into insurmountable difficulties when discussed for adoption in Europe. Usually, when this suggestion is put forward, the expert adopts a worried expression and explains that this is a very delicate problem by virtue of the various national laws affecting the exchange of aircraft equipment and spares. When it comes to a question of " personnel exchanges " efforts are, more often than not, restricted to enticing pilots and engineers away from other airlines.

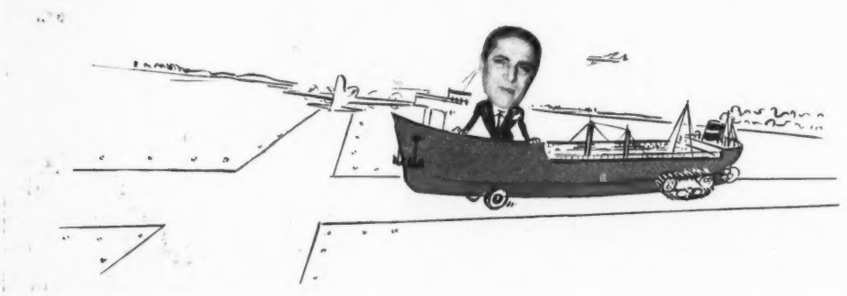
But Olympic and U.A.T. are tackling their association on a much more serious basis; from the beginning it appears that they have decided upon a coordinated purchasing programme, the joint training of personnel, and closely integrated ground organizations.

Obviously such agreements are made, not only to promote the idea of cooperation between airlines, but because both parties expect to receive concrete benefits therefrom. To give an example, a glance at the route network of the French private operator reveals a large degree of conformity with those areas of particular interest to the newly-formed Greek company. Anyway it is clear that Onassis, from the commencement, has welcomed cooperation in one form or another. Already, in July 1956, when he first acquired the former Greek national airline T.A.E., in order to build his Olympic Airways, he stated: " We do not intend to enter into fierce competition with foreign airlines, but hope to arrive at a form of partnership as far as possible ". Enlarging on this theme at a later interview, Onassis commented: " Our modern system of life outlaws individualism today; everything is done through public corporations, associations and groups of people, and, however much one may regret these developments, it would be foolish to oppose the system ".

Briefly the story leading up to the foundation of Olympic Airways is as follows: After the end of 1947, when the Greek national airline TAE had declared its last dividend of 4 %, the company's financial position deteriorated drastically and placed an ever-increasing burden of millions of drachmae on the Greek taxpayers. In 1955 the Greek Government decided to abandon the project, appointed a liquidation administrator, and offered the company for sale to private enterprise. The contract was awarded to the shipowner Onassis, who, on July 30th, 1956, was granted a franchise for the operation of all domestic and international routes. Onassis then formed Olympic Airways Company, with a capital of $1.5 million, and acquired the entire T.A.E. fleet comprising one DC-4 and 14 DC-3 aircraft. To supplement this fleet Olympic Airways then chartered from U.A.T. 2 DC-6Bs, and since June 2nd, 1957, has operated a four times weekly service on the Athens-Rome-Paris-London route. Connections to Turkey and Egypt have also been established. In addition a series of domestic routes have been opened and, in the near future, it is planned to inaugurate services to other European States, and to South Africa and the U.S.A. In the meantime Olympic has ordered from Douglas Aircraft four more DC-6Bs for delivery in July-September 1958, and 2 DC-8 jet liners for delivery in mid-1960.

This appears to have achieved the initial objective, but Aristotle Socrates Onassis has not only a flair but also an appetite for big business, and he is not likely to be contented with this preliminary nibble at the apple. To his new venture he brings not only a wide experience, but also all the qualifications for success. In 1929, when a young tobacco dealer in Buenos Aires, he played a large part in preventing the outbreak of a " customs war " between Greece and his new country; he has the art of diplomacy in dealing with stubborn officialdom. He entered the shipping business in 1932, at a time when the merchant shipping companies were faced with financial catastrophe; three years later, however, shipping boomed, and Onassis had laid the foundations of his financial empire. Today, although the world's air transport industry is not exactly at death's door, the future, according to Sir William Hildred, is not without its problems. Can we, then, expect a parallel boom about the year 1960?

One thing is clear, however. The older established European and world air transport companies will not be able to ignore the future activities of their new associate.



When is that standardization coming?

Anyone examining the detailed timetable for the introduction of a uniform system of measures as put forward by I.C.A.O. in the late forties, would imagine that everything should be in apple-pie order today, in the mid-fifties. That this is not the case is revealed by the following heartfelt cry from an airline pilot who has been in service for many years with one of the leading European airlines. — Editors.

Were would civil aviation be today without I.C.A.O.'s gentle, if not genteel, coaxing? Nowhere else but in a mud-pie of conflicting standards, procedures and national idiosyncrasies.

Bearing in mind the fashion for self-assertive nationalism, the measure of I.C.A.O.'s success in bringing national practices more and more into line with each other is nothing short of phenomenal;

but having achieved this, the member States are tending to rest on their laurels and to let the implementation of their decisions look after itself.

Aviation today is expanding faster than any other business. Technically it is leaping ahead almost faster than we can keep up with it. But operationally it is shod with diver's lead-soled boots.

No longer is there room for individual interpretation of resolutions coming out of I.C.A.O. and I.A.T.A. Every State must give its " decision for standardization ". And standardization is not being put forward for its own sake. It is being put forward in the interests of air safety.

Consider the plight of a pilot in dealing with meteorological reports. In Britain he will be given wind speed and direction, visibility in yards, weather conditions, cloud base in feet and coverage in eighths. In the metric countries the reports will be served up in much the same manner, but visibility will be quoted in metres or kilometres and cloud base in metres.

On the American continent the reports are given quite differently. Cloud conditions come up first and are described as, for instance, " scattered ". Visibility is presented in yards or more often in fractions of a mile, followed by weather and wind velocity and direction. But the variations do not end there. On the ground the Americans will quote wind direction in degrees True and in transmissions from the Tower in degrees Magnetic, with winds served up in knots or statute miles.

On the face of it, all this may seem unimportant, because a pilot accustomed to using feet will merely have to multiply metres by three to get an approximate answer he can understand instinctively; and conversely. Likewise, he can adjust himself to converting other units of measurement. But the very fact that he has to make the conversion at all is important. It distracts his attention; it takes time, and it adds to the already heavy burden placed squarely on his shoulders.

What standards of measurement are adopted makes no difference, as long as everyone uses the same ones. Logically, the metric system should be selected because of its intrinsic simplicity, and because it is right for a modern industry like aviation.

Now consider the question of vertical separation. Although I.C.A.O. recommended the establishment on a world-wide basis of the 1,013.2 millibar standard setting procedure for altimeters as a simple expedient to ensure adequate vertical separation of aircraft, particularly at high altitudes, there are numerous anomalies.

In Europe and the Mediterranean, Spain and Portugal go by the standard procedure, whereas France, next door, stands by the QNH method * as do Italy, Greece, Turkey and the other N.A.T.O. countries. France and Italy were prepared to follow the I.C.A.O. recommendation, but because the R.A.F. complained that the change-over would cost them a certain number of flight levels which they were anxious to retain, and because trans-Atlantic operators overflying Britain objected to the rapid succession of procedures they would have to employ if Britain did not follow suit, the French and the Italians reversed their decision.

Tunisia, Malta, Syria and Egypt are among the countries which have adopted the I.C.A.O. setting, although the United States retains QNH. And in the Philippines a curious situation arises where the Manila Flight Information Region applies the 1,013.2 method, and Manila itself the QNH procedure.

Where QNH is in force, there are also differences in its application. In some countries, setting changes are made at predetermined spots on airways, whereas in others they are made on the best available information; nothing hard-and-fast that will minimize collision risks.

That the I.C.A.O. method has definite advantages can no longer be disputed, but it would appear that those countries which persist in clinging to QNH will continue doing so until disaster forces their hands. Meanwhile more and more civil aircraft are venturing into the upper airspaces hitherto the preserves of the military with little more for protection than the alertness of their crews who, quite apart from carrying technical operating

intricacies of modern aircraft at their finger tips, must be familiar with the idiosyncrasies of every country through which they must fly. And the faster they fly, the more impractical it becomes for them to be continuously resetting QNH's.

Why individual countries should want to interpret I.C.A.O.'s recommendations in their own fashion seems not so much due to local conditions, but to psychological complexes and commercial interests that cut across any regard for crew work loads and humanity—and it raises this question: Why, when every nation accepts feet as a standard for flight level measurement and quadrantal separation, should some South American States decide to use metres instead? There is no logical answer, particularly as practically all their equipment is North American or British whose altimeters are calibrated in feet!

The list of anomalies could go on for ever, and by digging a little deeper would come to light even within the airlines themselves: like B.O.A.C. who calculate all their payloads in kilos and some of their fuel loads in lbs. And while we are at it, why not mention Imperial gallons, U.S. gallons and litres?

The unfortunate thing about these niggling variations is that there is a tendency to consider each one separately, and as such none is considered important enough to merit strong action. Taken collectively though, they add up to an awful lot of extra work which no pilot should have to do.

Safety in the air depends on a pilot being able to think clearly, work calmly and act confidently. Only by simplifying his task can this be achieved. And only by standardization of measures, procedures and in many cases, equipment, can that simplicity be achieved.

* Under which the altimeter is set to such a pressure that it would indicate zero on touching down at the airport.

The railways can do it . . .

On June 3rd, 1957 the newspapers reported that the railway administrations of Belgium, France, Germany, Luxemburg, Italy and Switzerland had demonstrated their new T.E.E. trains to the European public in Luxemburg. — The T.E.E. network (Trans-Europe Express) had been taken over as a joint operation by the European railway administrations at the beginning of the summer season. — " United Europe on Rails " was now being celebrated in Luxemburg.

" United Europe on Rails " . . . Even without the above newspaper report, it is well known that Europe's railways have been actively cooperating for decades. Track gauges, signalling system, technical safety equipment for trains, dining cars. . . without being under a single management, European railways form a technical and—in certain areas—an economic unity.

What of the " United Europe in the Air "? Technical and economic coordination has been the professed aim and object of Europe's airlines for some time, but the practical results have so far been meagre.

For example, the **European Civil Aviation Conference** held its second session in Madrid from April 24th to May 11th, 1957. The object of the Conference, created by eighteen European countries at Strasbourg in 1954 and converted into a permanent organization at the end of 1955, is to **liberalize European air transport**, i.e., to free it from the uneconomic restrictions placed on it by the legislation and administrations of the individual countries. Within certain limits the Strasbourg Conference is a kind of European regional organization of I.C.A.O., from whose Paris office it conducts its administrative business.

What has the European Civil Aviation Conference achieved up to the present? The results of the two sessions, in Strasbourg (1955) and Madrid (1957), can be summarized—unfortunately—in a few words. The Strasbourg session, understandably, contented itself in essentials with preparing an overall plan of future work. Nevertheless, a multilateral agreement on liberalization for small commercial aircraft (aircraft for a maximum of six passengers, employed on taxi and charter services on routes not competing with the scheduled airlines) was arrived at.

The Madrid session did not produce the long-desired agreement on liberalization of scheduled transport, but restricted itself to a series of generally worded recommendations for the facilitation of technical and commercial landings in European operations. The following questions were put on the " study programme ": increased cooperation in the training of aircrew and ground personnel, preparation of an agreement on passenger exchange and reciprocal recognition of certificates of airworthiness, standardization of the clauses in bilateral air transport agreements, liberalization of European domestic freight traffic, etc.

To put it briefly, the railways have put standard express trains on their routes. The air transport authorities, on the other hand, are still dealing with preliminary theoretical questions.

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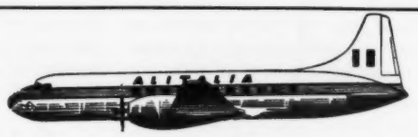

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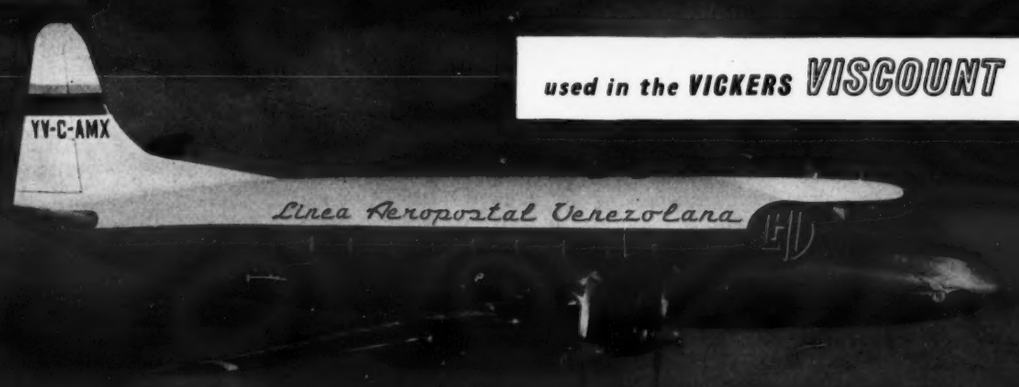

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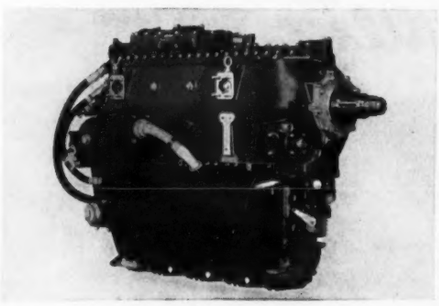

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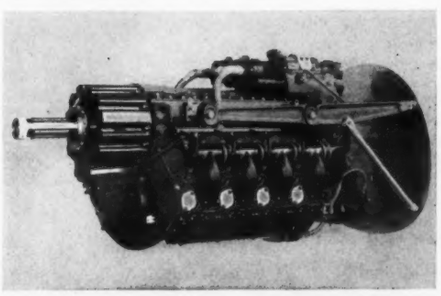

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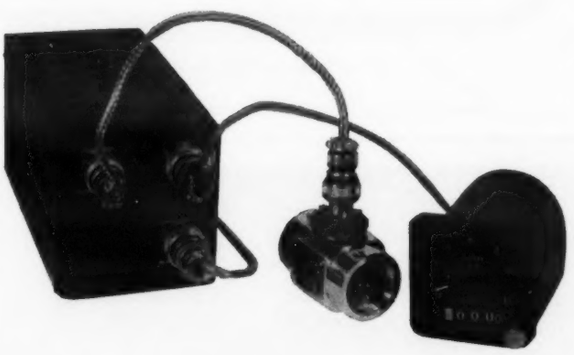

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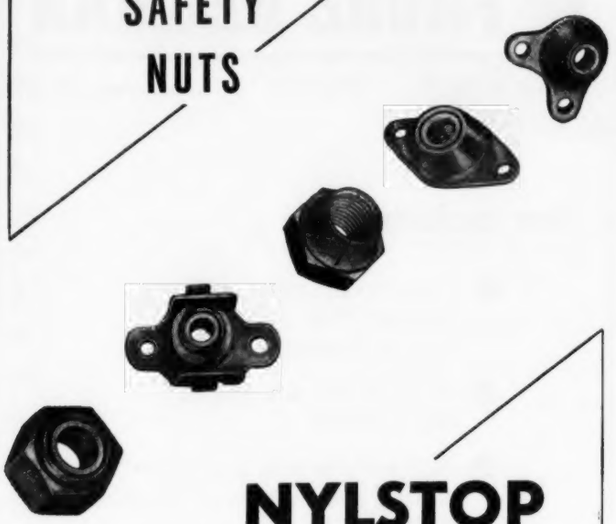

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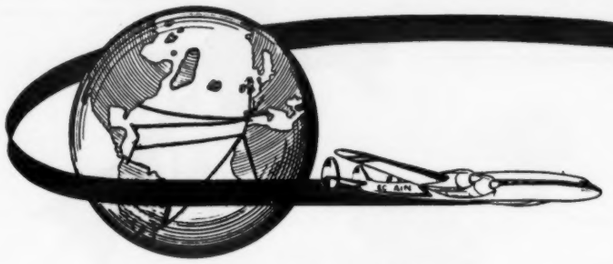

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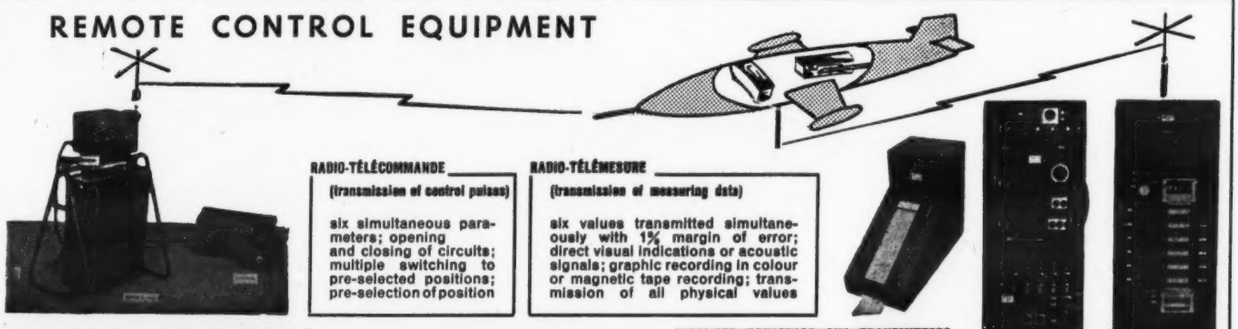

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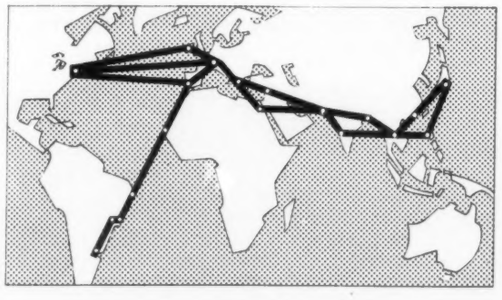

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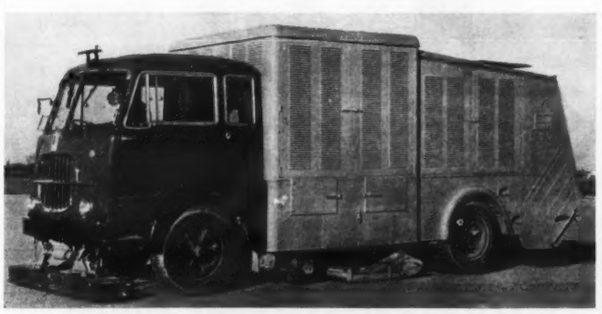

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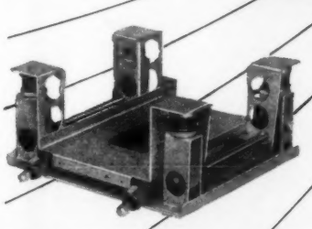

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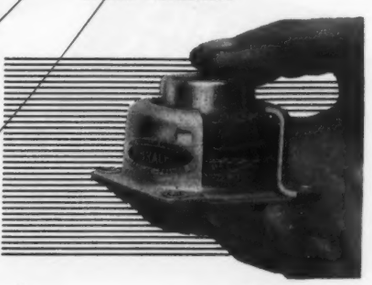

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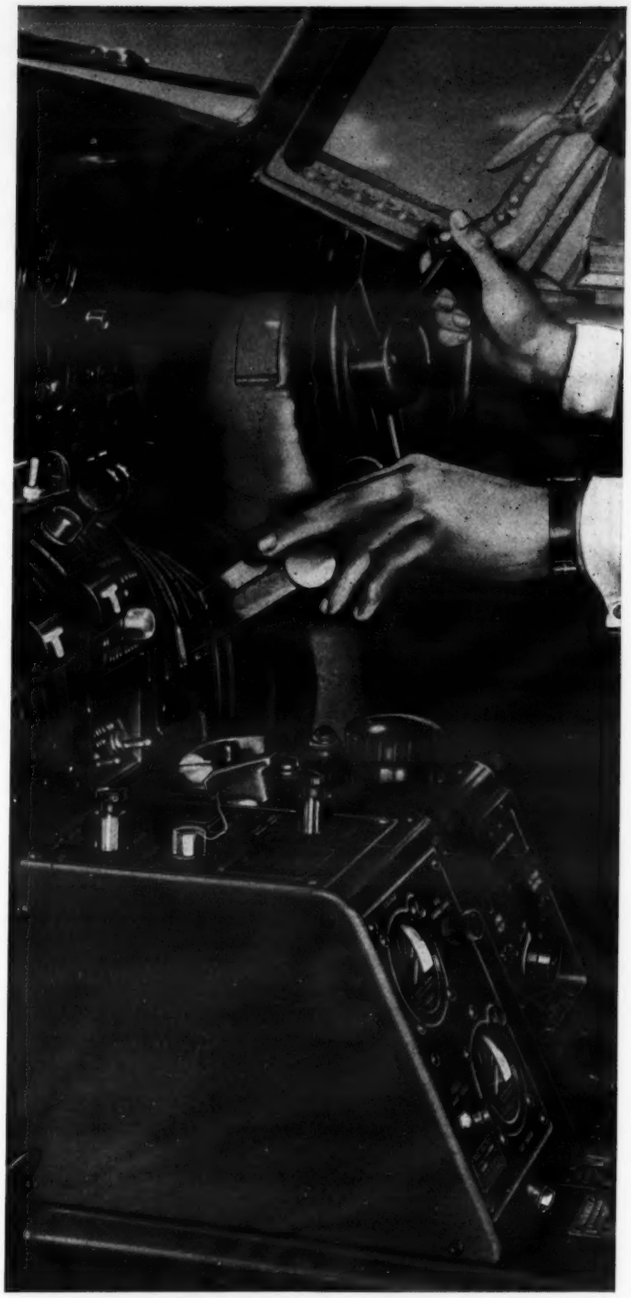

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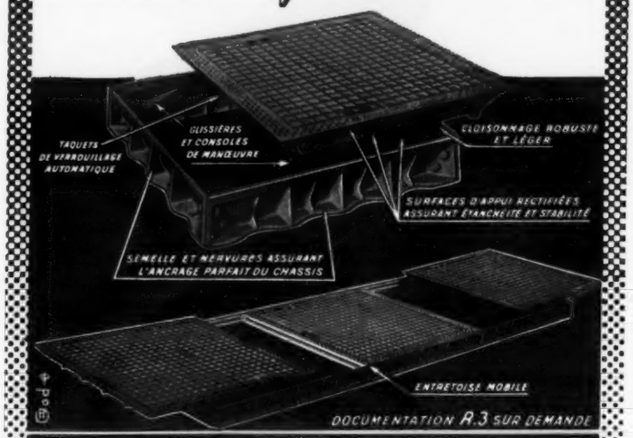
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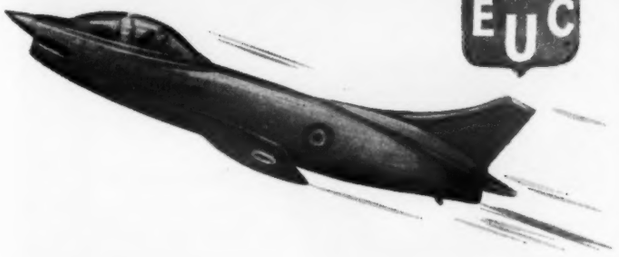

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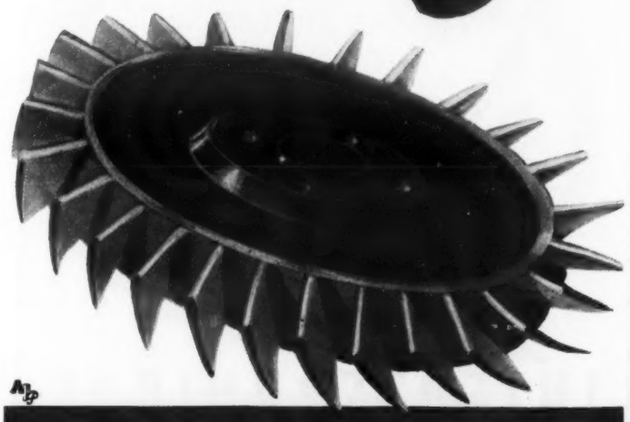

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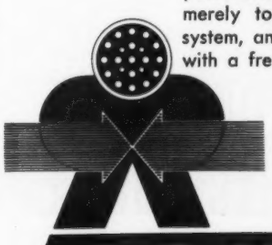

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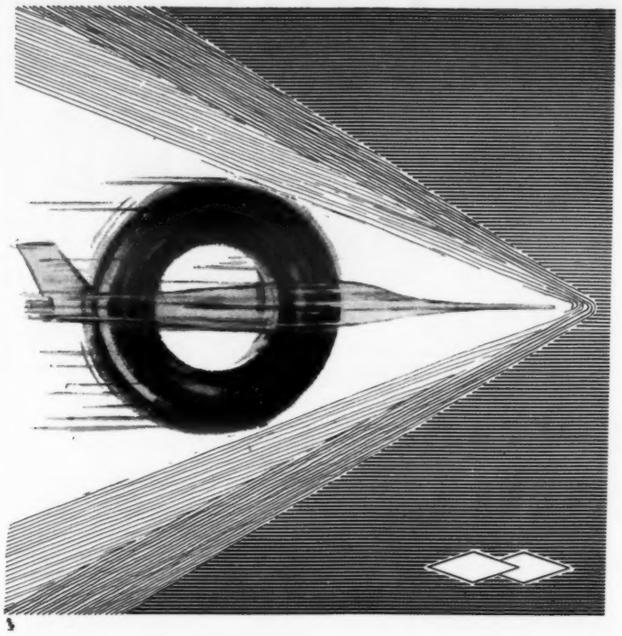

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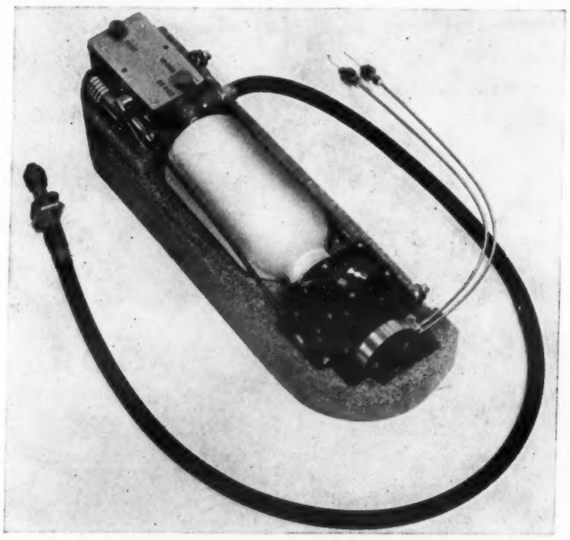

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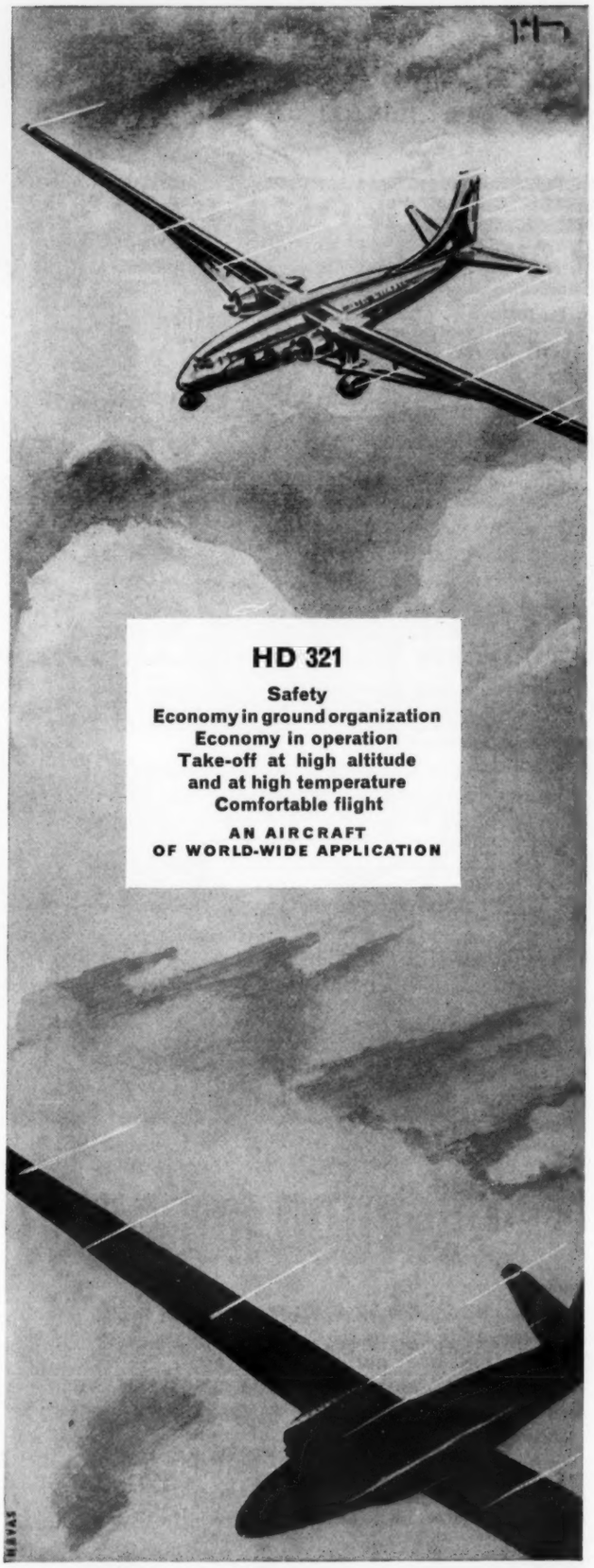

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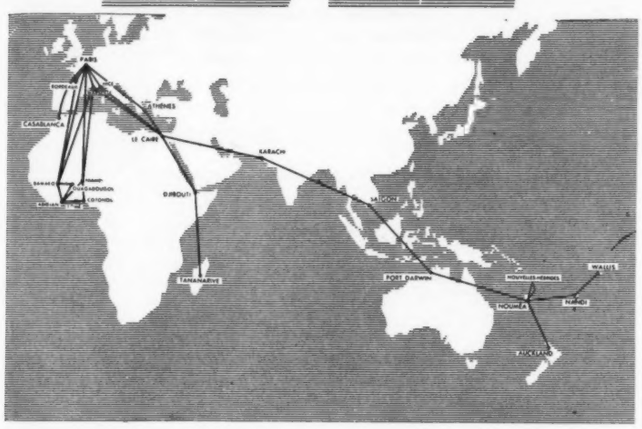

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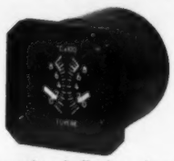

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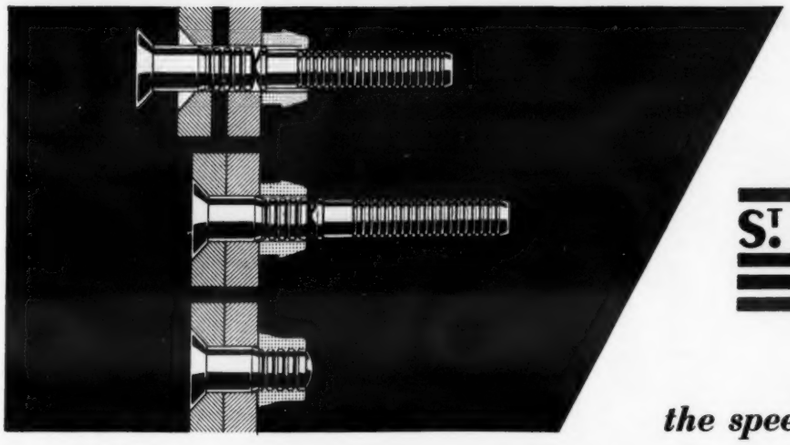

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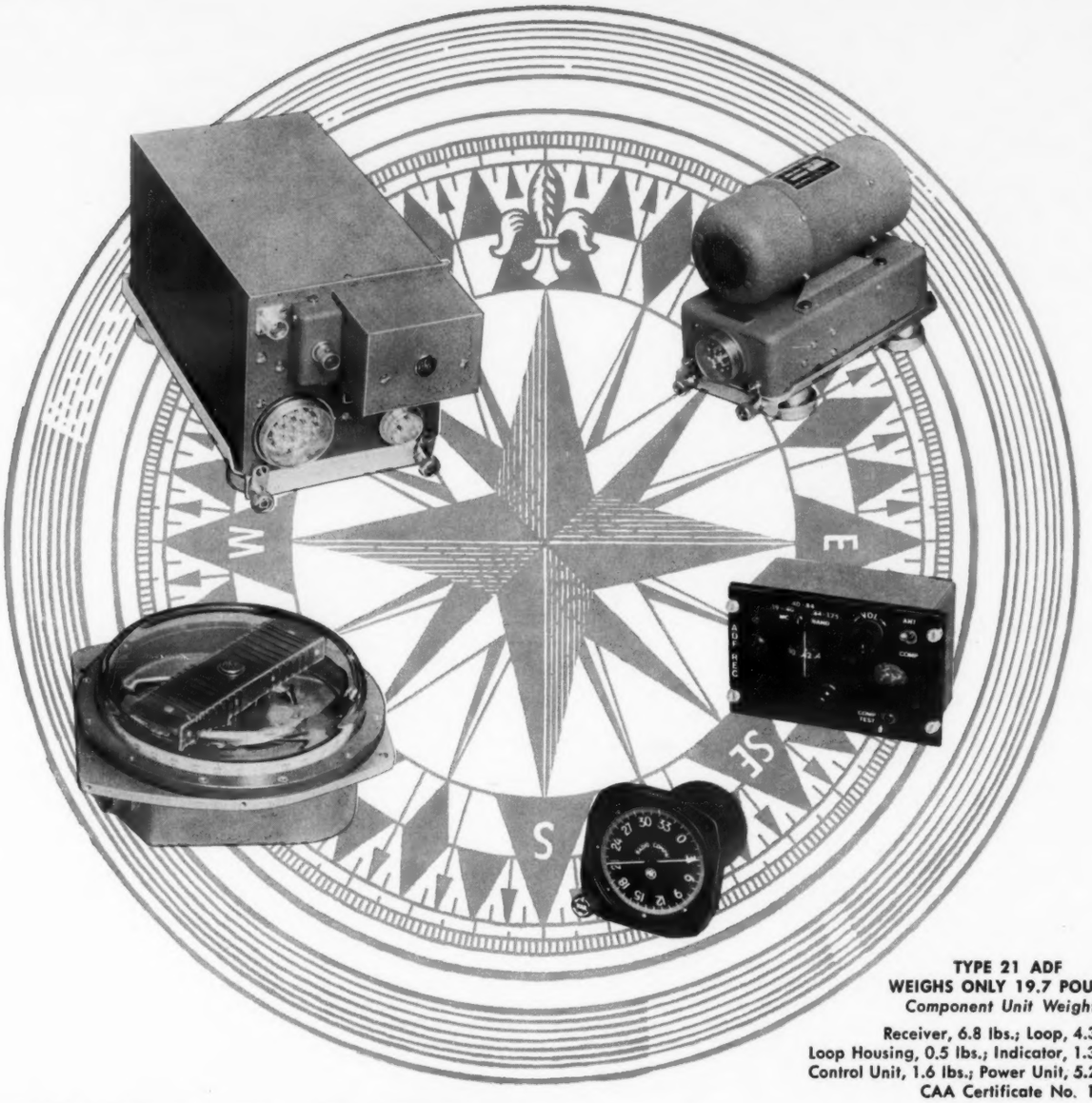

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